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CHAPTER ONE – INTRODUCTION

1. SCOPE

This document presents an overview of the requirements for interfacing and interoperating with the Combined Arms Tactical Trainer (CATT) family of simulation systems. It provides a means to determine the level of interoperability of any simulation system with respect to the target CATT system. The candidate system will be tested against established parameters to receive an interoperability rating based on its performance characteristics.

The CATT family is being developed to support training at the platform through battalion task force levels. It will ultimately include manned simulators for armor, mechanized infantry, dismounted infantry, air defense, and aviation, as well as computer-generated forces (CGF) inter-operating over a distributed network environment. The set of simulation systems will be based upon a common infrastructure, which provides exercise control, environmental representations, and other “common” data and services. The initial (and current) baseline for the CATT, the Close Combat Tactical Trainer (CCTT) System, is being used as the standard by which interoperability with CATT is measured. As the CATT system evolves, this document will be updated to reflect the capabilities and characteristics of the CATT baseline simulation system. This document is, therefore, a living document.

This work in progress, which supersedes current CCTT Interoperability Description Document, begins with an overview of the CCTT architecture and training objectives. It continues with descriptions of the method by which the simulations are controlled, the format and mechanism through which the simulation data is to be exchanged, and the characteristics of the synthetic environment. Sets of tests are given with respect to the parameters in each of these three characteristics of interoperability with an importance weighting of each parameter. In the final chapter, an Interoperability Rating (IR) matrix is provided to interpret the results of the tests.

2. INTEROPERABILITY

2.1 CONCEPT OF INTEROPERABILITY

Interoperability enables distributed heterogeneous simulation systems to be interactive so that a meaningful exercise may be conducted. At the highest level, three general characteristics are evaluated to determine interoperability. First, a consistent method by which the exercise is controlled must be established. Second, the communications mechanism used to exchange object and event data must be chosen and consistent. This includes the method of transmission, the format (protocol) and content (semantics) of the data. Finally, the simulations must operate in a common synthetic environment. The synthetic environment not only includes the simulated terrain, atmosphere, and ocean, but the simulated entities and objects as well. Since each of the interoperating heterogeneous simulation systems provides its own localized representation of the synthetic environment, care must be taken to ensure that correlation exists between the individually generated representations.

Provided that the managed heterogeneous simulations are capable of exchanging simulation data, correlation and consistency of that data are the key factors in determining the level of interoperability. Data correlation does not necessarily require that objects be represented in the exact same way, although identical representations ensure correlation. Because fidelity requirements for the participants’ roles are

part of the simulation system design, there is likely a need for varying fidelity requirements for the synthetic environment, i.e., the level of fidelity for an object representation is dependent on the owning

simulation itself. For example, a manned module generally requires a higher level of fidelity than does a constructive simulation. For data to be correlated across levels of fidelity, it only needs to be interpreted by its consumer in a consistent fashion across the simulation. To be more specific, consistency requires that an interaction between an object/event and the simulation produces the same acceptable result(s). There are a couple of factors that determine whether data is interpreted consistently. The most obvious is the ability of the simulation to consume the data in a meaningful way. The second is the results of the data evaluation by the algorithm(s) employed by the simulation. When heterogeneous simulation systems have both similar functions and capabilities, and a standard for the exchange and consistent interpretation of information exists, then these systems are said to be interoperable. The level of interoperability is inferred from the level of consistency in each and every factor.

Beyond data transmission and interpretation exists an additional level of simulation consistency. This characteristic is commonly referred to as “fair fight”. To achieve fair fight conditions, simulation must not only interpret the environment and relevant communications consistently, but also react to the results of that interpretation in a consistent manner. For example, in “fair fight” conditions, a computer-generated entity must respond to stimuli (e.g., weapons fire, threat presence), as would a participant in a manned module. Although “fair fight” is not directly addressed in this measurement of interoperability, the level of interoperability between individual simulations greatly predicts the success of creating “fair fight”.

2.2 LEVELS OF INTEROPERABILITY

The following interoperability ratings are defined for applications:

2.2.1 NON-INVASIVE (LEVEL 1)

Definition

A simulation / simulator system is said to be non-invasive if it is able to operate on the local area network (LAN) in the same exercise with the CCTT system without degrading the performance of the CCTT system.

2.2.2 COMPLIANT (LEVEL 2)

Definition

A simulation / simulator system is said to be compliant if it is non-invasive and it implements the DIS protocols in accordance with the IEEE Standard 1278.1-1995. A specific compliance determination must be made regarding each Protocol Data Unit (PDU) generated and interpreted by the simulation system.

2.2.3 COMPATIBLE (LEVEL 3)

Definition

A simulation / simulator system is said to be compatible with CCTT if (1) it is compliant; (2) its models and databases send and interpret PDUs in support of the realization of a common

synthetic environment (coherent in space and time); and (3) it is managed in a way that is consistent with CCTT.

2.2.4 INTEROPERABLE (LEVEL 4)

Definition

A simulation / simulator system is said to be interoperable with CCTT if it is compatible and, for a given exercise, its performance characteristics support the fidelity required for the CCTT interoperability exercise.

2.2.5 FULLY CORRELATED (LEVEL 5)

Definition

A simulation / simulator system is said to be fully correlated if it is interoperable and provides exact correlation in all aspects of the synthetic environment, data sets, and algorithms as CCTT.

Note:

Although there is no Interoperability Level 0, the simulation / simulator system will be given this designation in the event that it is physically unable to connect to a network under which CCTT is running or causes such severe disruption of operations while connected to a CCTT network that it must be disconnected. A simulation / simulator system unable to achieve Level 1 is said to be *Invasive*.

2.3 INTEROPERABILITY MATRIX

2.3.1 INTEROPERABILITY DEFINITIONS

The following terms are used throughout this chapter in describing testing of simulation systems for Interoperability with CCTT.

Capability Area – For the purpose of the CATT ICD, Areas of Capability refer to Chapters 3 through 7 of the CATT ICD Document:

- Infrastructure
- Simulation Management
- Synthetic Environment
- Communications
- Image Generator

Interoperability Test – The measurement and assessment of a *Testable Attribute*.

Application Under Test (AUT) – The Simulator / Simulation System whose interoperability with CCTT is being assessed.

Entry Level of Interoperability – The prerequisite (minimum) level of interoperability required to enter into an *Interoperability Test*.

Exit Level of Interoperability – The level of interoperability that an AUT falls back to when an *Interoperability Test* is failed. This level can be less than or equal to the *Entry Level of Interoperability*.

Capability Test Set – The set of tests that may be used to assess the overall interoperability rating of an AUT within a specific *Capability Area*.

Interoperability Level Test Set – The set of tests that verify a specific level of interoperability within a *Capability Test Set*.

2.3.2 WHAT THE INTEROPERABILITY MATRIX CONTAINS

The following definitions apply to the column headings in the Interoperability Matrices:

Chap – The chapter in the *Interoperability Control Document* from which the requirement is derived.

ICD Paragraph Title – The heading/title of a paragraph in the ICD document which contains a *Capability Detail's* requirement for interoperability with CCTT.

Capability Detail – A specific capability that is within the scope of a *Capability Area*.

Testable Attribute – An attribute that may be measured to assess a *Capability Detail*.

Attribute Test Sequence – The suggested order in which the attributes are to be tested. The order is based on the *Entry Level Test/Exit Level* for the attribute being tested.

Entry Level Test/Exit Level – The Interoperability Level at which the test will occur and the Interoperability Level it will exit with upon failure. For example: In the Simulation Manager Matrix there is a “2” in the column titled Entry Level Test /Exit Level for the testable attribute *infr_broadcast*. This signifies that this test will be conducted during testing for Interoperability Level 3, and that if the attribute fails this test the AUT will exit this test back at level 2. Passing this test will allow testing for Interoperability Level 3 to continue.

Test Approach – The type of test used to verify whether the attribute passes the level of Interoperability defined in *Entry Level Test/Exit Level*. The suggested approaches are *DIS Tool Test (DTS)*, *Output/Visual Inspection* during Exercise, and *Code and/or Data File Inspection*. The test developer is not limited to this list of approaches, and has the flexibility to create tests as needed. A short definition of each current test approach follows:

Test Approach Methodologies

Test Type	Definition
DIS Tool Test	<p>The DIS Test Suite (DTS) has been developed to perform DIS Compliance Testing. The DTS consists of test processes, procedures, and tools to measure the level of compliance of a Simulation Application (SA) with the IEEE Standard for Distributed Interactive Simulations - Applications Protocols (12 78.1 - 1995). The DTS will:</p> <ul style="list-style-type: none"> • Generate testing scenarios to interact with Simulation Application, • Record PDU traffic, • Analyze DIS performance, • Provide detailed Reports of Analysis, and, • Provide 2D/3D viewing capabilities of exercise simulation.
Output/Visual Inspection during exercise	<p>A specific CCTT exercise designed to test attributes which cannot be tested with the DTS and which are visual in nature or which require interactions with CCTT components. The exercise may be set up to test multiple attributes i.e. looking through the viewfinder of a manned module AUT placed at a specific location on the database to verify that the viewing range is compatible with CCTT, and, in the same exercise, verifying through the AAR that the moving models of the module are consistent with CCTT as the AUT moves across various types of terrain.</p>
Code and/or Data File Inspection	<p>Attributes which cannot be tested by either of the other 2 approaches and yet can be verified through code/data file inspection. For example, when testing the physical characteristics of a manned module simulator, the mass cannot be seen. There is no definitive method to visually determine whether the vehicle weighs 1,000kg or 60,000kg and yet the weight is important as it relates to vehicle behaviors and interaction with other objects. In this case, a quick look at the reader file corresponding to the module will contain this information.</p>

Frequently a combination of checking the data files for information and watching for certain behaviors during an exercise may allow for greater certainty that the attribute passes the test.

Manual Test Method Available – In lieu of automated testing using the DTS, a Y(es) in this column signifies there is a way to manually test an attribute for Interoperability.

Test Notes – Specific information that will help the user design or administer the test, or help interpret the results in order to make a better determination of the success or failure of the test.

For the Interoperability Matrices found in Chapter 9 (concerning P3I Enhancements), another column has been added to represent the *Capability Area* in which the attribute belongs. At such time that one of these enhancements is incorporated in the CCTT baseline, that matrix's attributes can be placed in the matrix specified in the *Capability Area* column. After all rows of the matrix have been removed the matrix will be deleted. This process will repeat as each P3I Enhancement becomes incorporated into the CCTT baseline.

2.3.3 HOW THE INTEROPERABILITY MATRIX WILL BE USED

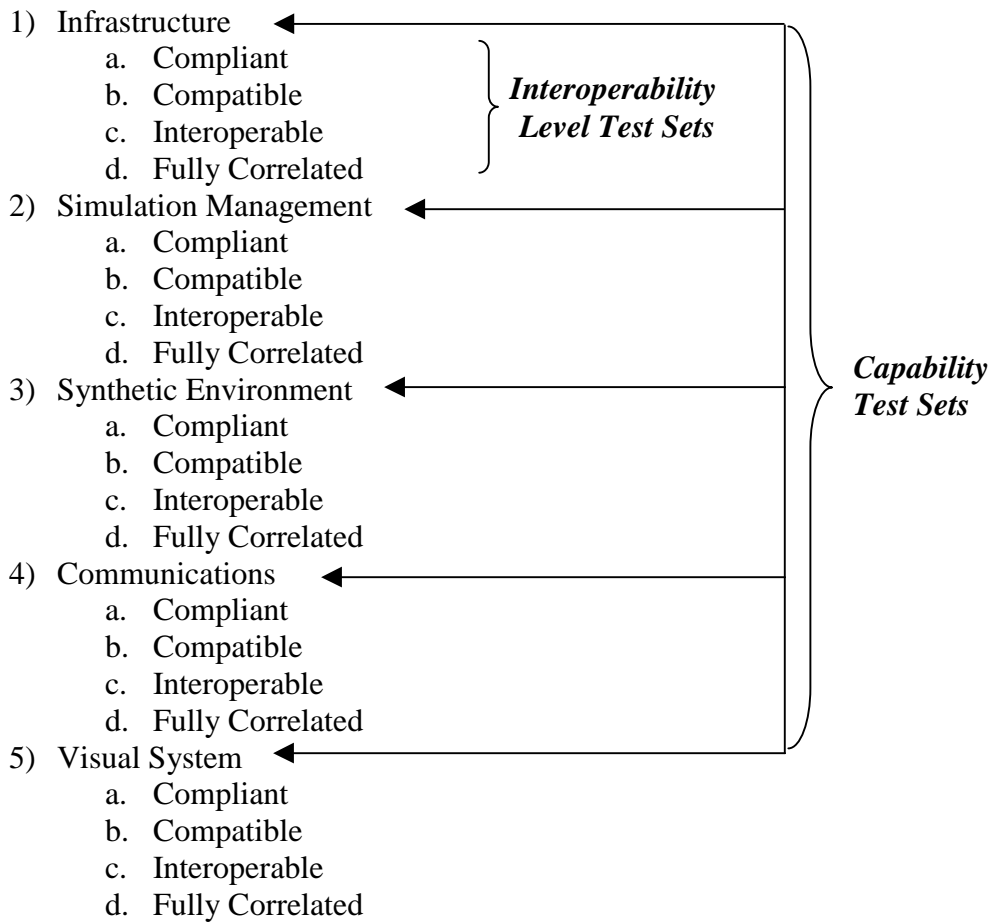
The interoperability matrix will be used to first, identify the requirements of the interoperability test system and second, to specify the design of each *Interoperability Test*. The interoperability test system will be used to verify specific levels of interoperability between the AUT and CCTT. The failure of a specific test is not necessarily a failure of the AUT. It simply indicates that a specific interaction between the AUT and CCTT is not interoperable. The *Attribute Test Sequence* identifies the order in which attributes are tested within a specific *Capability Area*.

SAMPLE INTEROPERABILITY MATRIX

Capability Area: Infrastructure														
Chap	ICD Paragraph Title	Capability Detail	Testable Attribute	Attribute Test Sequence	Entry Level Test /Exit Level					Test Approach			Manual Test Method Available	Test Notes
					1	2	3	4	5	DIS Tool Test exercise	Inspection during Output/Inspection	Code and/or Data File Inspection		
	Physical Connectivity	Support a Network connection	Network Connectivity	1.1	0	N/A	N/A	N/A	N/A		Y			If application can be physically connected to network without causing disruption to network. If network operations disrupted, application does not meet level-1.
	Data Packaging and Traffic Segmentation	Participating simulation systems shall adhere to IEEE standard 1278.1	Network Connectivity	2.1	N/A	1	N/A	N/A	N/A	Y				PDU sent and received conform to the format and associated enumerations for the family of PDUs.
		A simulator system shall support PDU Concatenation	Concatenated PDUs	2.2	N/A	1	N/A	N/A	N/A	Y				
		Maximum Transmission Unit (MTU) of the network on which CCTT is connected shall be 4352 bytes with 4096 bytes of data.	Network Packet size	2.3	N/A	1	N/A	N/A	N/A	Y				
		Siman PDUs conforms to structure, values and enumerations	CCTT DIS enumerations	3.1	N/A	N/A	2	N/A	N/A	Y				MCC will not send SIMAN PDUs to applications which do not map directly to a CCTT configuration type.
		Supports MCC protocols, Power-On/Off.	SIMAN Protocols	5.1	N/A	N/A	N/A	N/A	4	Y				Receive and Respond to Action Request PDUs.
		Supports MCC protocols, Initial Conditions.	SIMAN Protocols	5.2	N/A	N/A	N/A	N/A	4	Y				Receive and Respond to Action Request PDUs.
		Support Big Endian byte ordering.	big_endian	2.4	N/A	1	N/A	N/A	N/A	Y				
	Multicast Groups within CCTT	Exercise specific data shall be sent and received on multicast groups reserved to Exercise specific traffic.	multicast_exercise_traffic_group	3.2	N/A	N/A	2	N/A	N/A	Y				Exercise specific PDUs identified in section 3.4 will be sent and received on multicast groups as described in section 3.1. Test should verify traffic sent on appropriate multicast groups.
		CGF Family of PDUs shall be sent and received on multicast groups reserved to CGF PDU traffic	multicast_cgf_traffic_group	N/A	N/A	N/A	N/A	N/A	N/A	Y				CGF specific PDUs identified in section 3.5 will be sent and received on multicast groups as described in section 3.1. CGF traffic are unique to CCTT SAF/CGF and should not be sent or received by other applications
		The location sensitive PDUs shall be sent and received on multicast groups reserved to Location sensitive PDU traffic	multicast_location_traffic_group	3.3	N/A	N/A	2	N/A	N/A	Y				Location sensitive PDUs identified in section 3.2 will be sent and received on multicast groups as described in section 3.1. Test should verify traffic sent on appropriate

2.4 INTEROPERABILITY TEST SYSTEM

The interoperability test system will be organized into six *Capability Test Sets*, one for each *Capability Area*. These test sets are further broken down into *Interoperability Level Test Sets* as follows:



Each test set has a prerequisite interoperability rating certification that must be satisfied before certification of the next level of interoperability may be gained for the *Capability Area* being assessed.

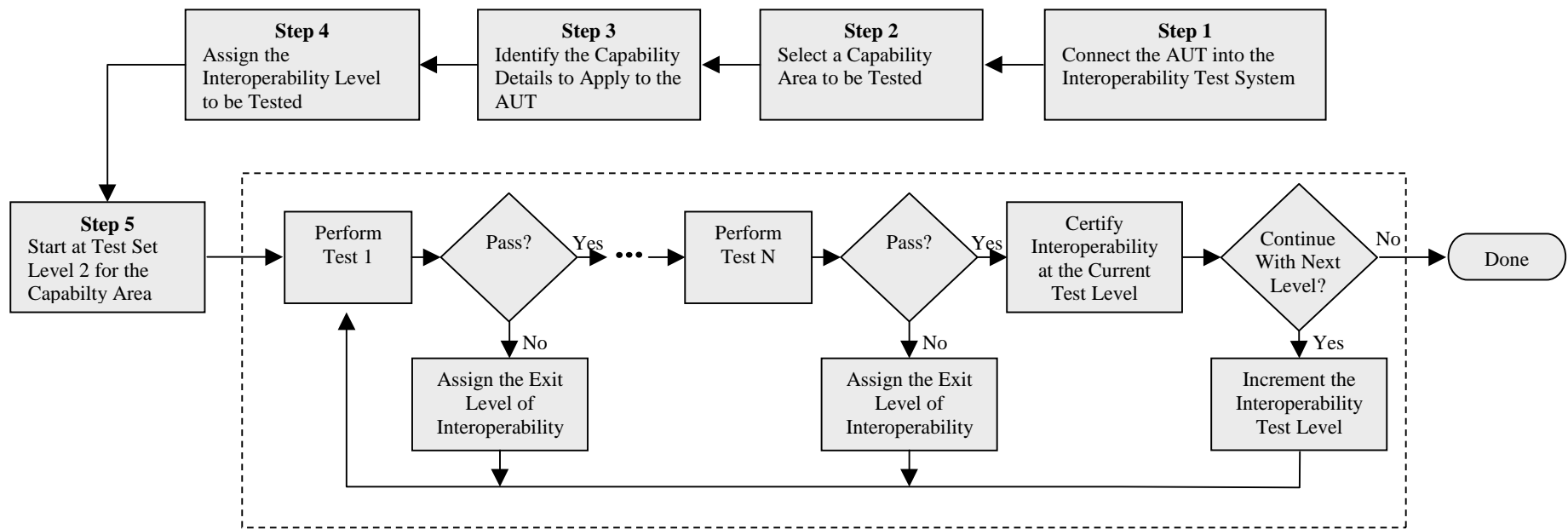


Figure 1. Capability Area Test Set Process Flow

Step1: Connect the AUT – The AUT will be connected to the test system over a network using Ethernet, FDDI or other applicable network connection.

Step 2: Select the Capability Area – The user will select the *Capability Area* to be tested.

Step 3: Select Capability Details – The user will identify what capability details apply to the AUT. Most applications do not need to support all possible interactions that may occur during an exercise. For example, ground maneuver trainers have no use for radar emissions, and therefore do not need to support interactions with radar (unless they emit radar).

Step 4: Assign Interoperability Test Level – The user will select the level of interoperability under which the AUT is to be tested. The test level may also be assigned from the exit level of another test set. For example, if the AUT is being tested for Level 4 interoperability, but fails a test based on DIS compliance, the AUT test level may be degraded to Level 2 (DIS Compliance).

Step 5: Execute the Test Set – The test set will be executed in the order as specified in the Interoperability Matrix for the selected *Capability Area* minus the *Capability Details* that do not apply to the AUT. If a test is failed, the exit level of interoperability will be assigned as the current level of interoperability for the AUT. The AUT will exit the test set with the lowest exit level of interoperability assigned during the tests. This becomes the entry interoperability level. If all tests are passed, the assigned (test) level of interoperability is incremented by one and the AUT proceeds to the next level of interoperability tests (See Figure 2).

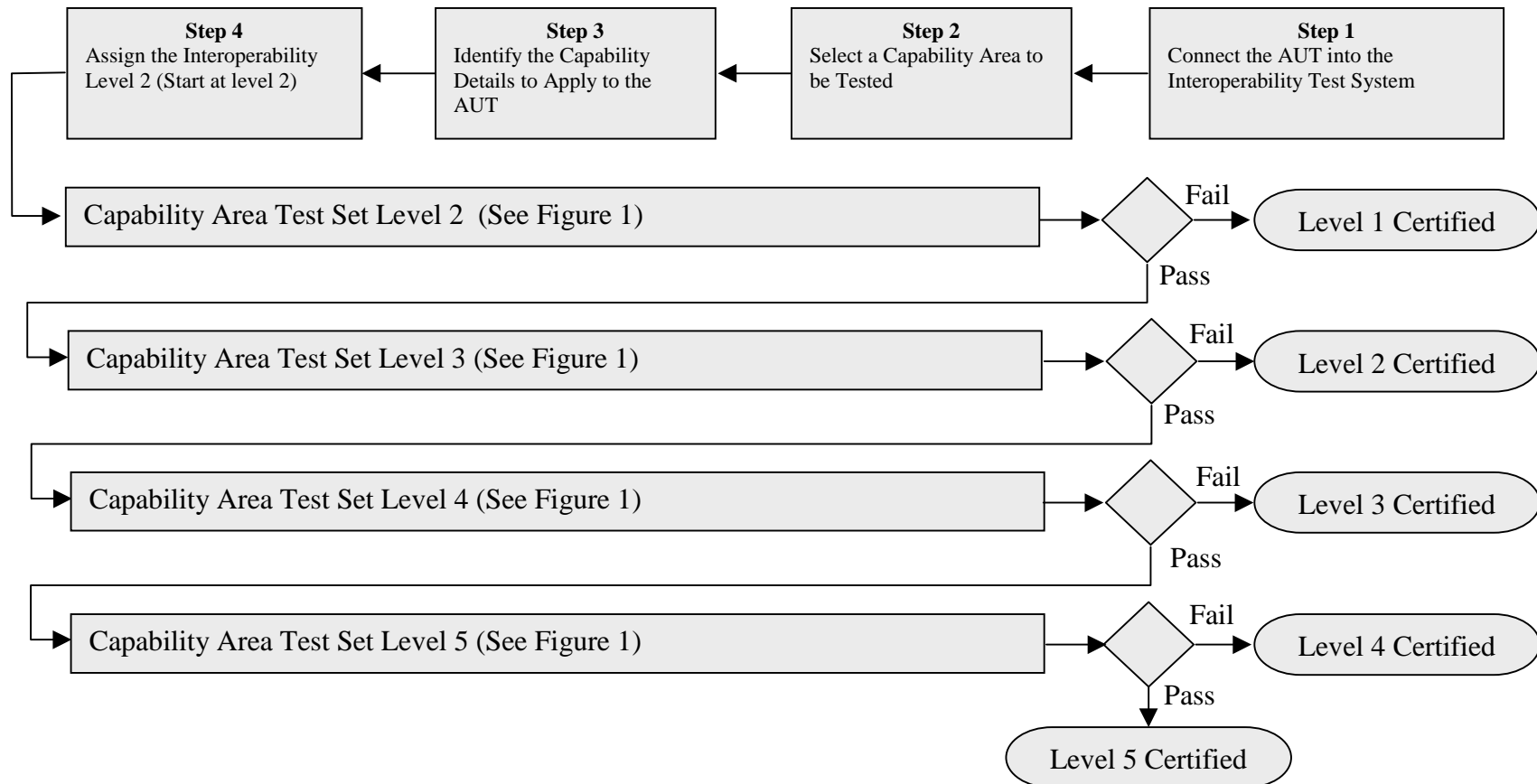


Figure 2. Interoperability Level Certification Process Flow

2.5 Interoperability Example

A test case has been created in order to show one way of testing for Interoperability. The existing matrices may be used as a basis for determining attributes necessary to achieve Interoperability with CCTT. The following is a simple test case in which Simulator XYZ is to be tested for Interoperability in the Infrastructure Capability Area (see end of chapter 3 for the matrix). The following steps will help to achieve this task.

- 1) Because all information concerning the Entry/Exit Levels, Attribute Test Sequence and the test approaches is completed in the Infrastructure Matrix, these are reviewed to see how they apply to XYZ. In the review it is noted that the following attributes have no application to our simulator:

Attribute	Test Sequence	Reason
multicast_radio_traffic_group	3.4	Radios are not utilized in XYZ
Data_region_aoi	N/A	Data region Area of Interested not supported in XYZ
multicast_cgf_traffic_group	4.1	No communication necessary with CCTT CGF workstations
multicast_cgf_traffic_group	5.3	Maximum entity values and dead reckoning don't apply to this simulator.
point_to_point	3.9	Point_to_Point not supported by XYZ.

- 2) Remove the above attributes from our Capability Test Set for the Infrastructure matrix.
- 3) The first *Testable Attribute* that must be passed is Network Connectivity. The simulator is physically connected to CCTT and CCTT is monitored to verify there is no disruption to the network. If this test were to fail, there would be no need to continue on with the testing sequence, as XYZ would be classified as Invasive.
- 4) When we look at the Infrastructure matrix we see that the majority of attributes can be tested using the DIS tool, also known as DIS Test Suite (DTS). Following the attribute test sequence on the matrix we see that to be certified at Level 2 we must test and pass all of the attributes which are in test sequence 2.x. The AUT is connected to the DTS and the test is run. The results are as follows:

Test Sequence	Test Method	Result of Test
2.1	DTS	Pass
2.2	DTS	Pass
2.3	DTS	Pass
2.4	DTS	Pass

Because all tests have been passed, simulator XYZ is now certified at Level 2 in the Infrastructure Capability Area. Failure in any of these tests would have forced an Exit Level of 1 according to the Infrastructure matrix.

- 5) Test for Level 3 Interoperability by running the following tests. The results are as follows.

Test Sequence	Test Method	Result of Test
3.1	DTS	Pass
3.2	DTS	Pass
3.3	DTS	Pass
3.5	DTS	Pass
3.6	DTS	Pass
3.7	DTS	Pass
3.8	DTS	Pass
3.10	Output/Visual Inspection...	Pass
3.11	Output/Visual Inspection...	Pass

Note that the attribute multicast_radio_traffic_group (3.4 in test sequence), along with 3.9, were not run as they were not included in the list of testable attributes. Also, notice that the last two tests were not tested using the DTS, but by a exercise output /visual inspection. This would normally be done separately from all DIS testing as it necessitates interacting with a CCTT exercise. After these tests have completed and passed, we are certified at Level 3.

- 6) Since there are no Level 4 tests to run (one was found on the matrix, but we previously excluded it from our list), we are certified by default to Level 4. In order to reach the 5th level, there are two tests to run, both of which can be run using the DTS. Once these last two have completed and passed, we are considered to be certified to Level 5, Fully Correlated.

Notes:

- ✓ Due to the large number of attributes that were to be tested using the DTS, it would have been simpler to run all of the tests in one session, keeping track of the results, and then running a CCTT exercise to complete the testing for Infrastructure. The sequence in that situation would be at the tester's discretion.

- ✓ If we had failed any tests along the way, for example, sequence 3.6, we would have failed to achieve level 3 and, based on the Exit Level associated with sequence 3.6, would have dropped back to Level 2 certification.

This process is to be repeated in each of the other Capability Areas. A final Interoperability Level will be assigned for each Capability Area.

CHAPTER TWO – SYSTEM OVERVIEW

CCTT provides training for Armor, Cavalry, and Mechanized Infantry platoons through Battalion/Task Force on their doctrinal Mission Training Plan (MTP) collective tasks. The CCTT system is the first fully DIS compliant training system. It's networked vehicle simulator manned-modules, Semi-Automated Forces (SAF) workstations with Computer Generated Forces, Combat Support workstations, and After-Action Review (AAR) systems are monitored and controlled by the Master Control Consoles (MCC) / Maintenance Consoles (MC). CCTT manned-modules include the M1A1, M1A2, M2A2/M3A2, FIST-V, M113, and the HMMWV. These manned-modules are high fidelity simulators, which require individuals and crews to correctly perform their respective tasks in order to successfully accomplish their collective missions. The Semi-Automated Forces have the capacity to create a wide variety of OPFOR (enemy) and BLUFOR (friendly) vehicles with which the units can train. The SAF entities exhibit highly realistic behaviors and can be tailored to varying levels of competence. Through the use of computer workstations, CCTT provides logistics, artillery, mortar, and aviation units for the synthetic battlefield. The effects of the workstation-created entities require units in training to plan for and coordinate the implementation of other Battle Operating Systems in support of their tactical maneuver. The supporting networks and protocols are fully DIS-compliant and provide CCTT with the capability to link with other DIS- and CATT compatible simulations.

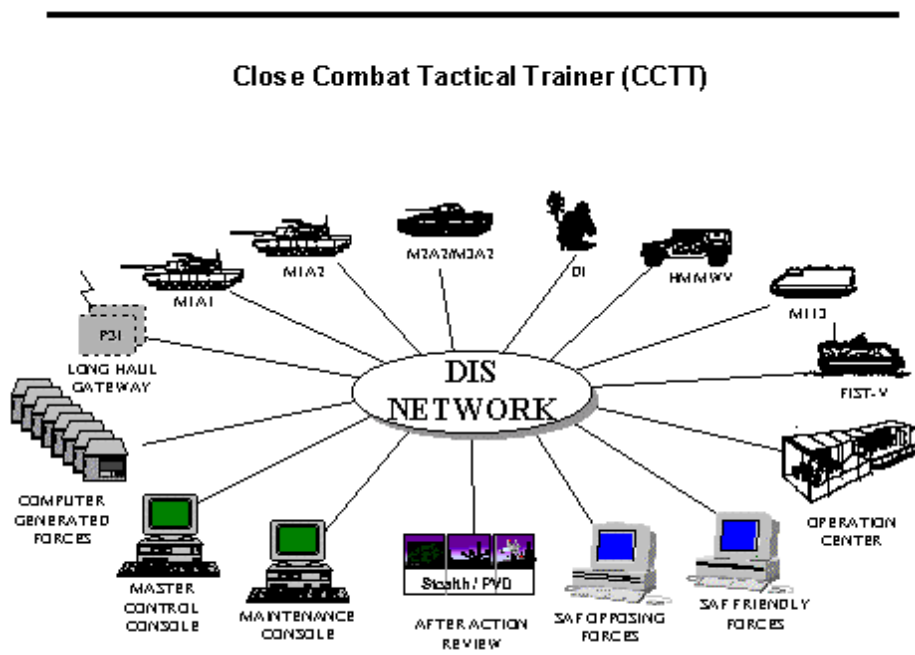


Figure 1 CCTT Components

The components of this system combine to create a highly complex synthetic battlefield on which soldiers can conduct training in a combined arms environment. The system allows unit commanders to train their unit's collective tasks in a variety of virtual environments to include: day, night, and varying fog densities. CCTT supports training for more than 83% of the Armor, Cavalry and Mechanized Infantry Platoon and Company/Team MTP defined collective tasks. Figure 1 represents CCTT components on the DIS network.

1. CCTT SYSTEM ARCHITECTURE

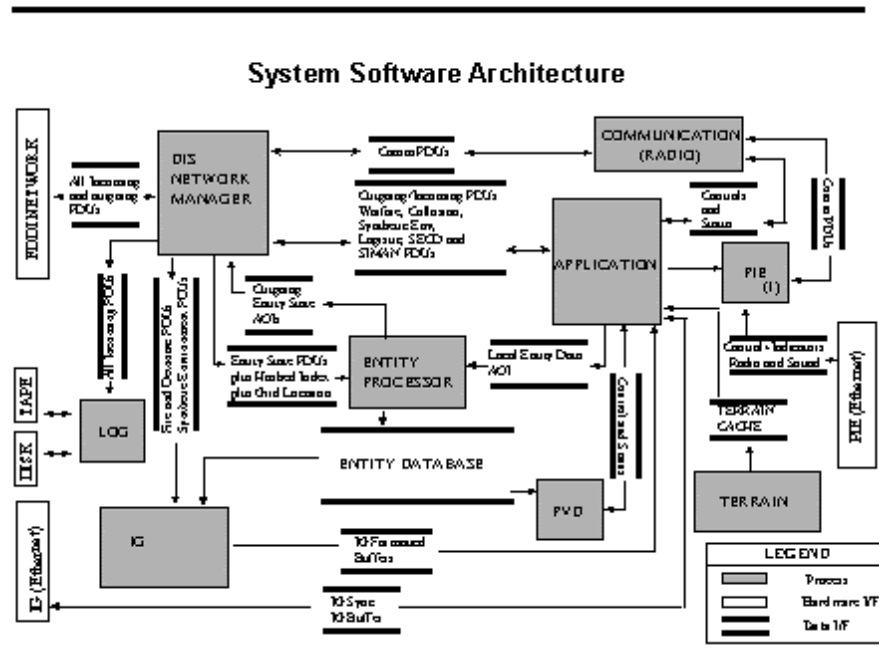


Figure 2. CCTT Architecture

The CCTT System consists of up to 100 processor units, depending on the site, connected by a Fiber Distributed Data Interface (FDDI) Local Area Network (See Figure 2). Each CCTT component has a processor unit to facilitate its function, such as perform vehicle computations, transmit updated vehicle information to the network, and accept information from other simulated entities on the network. The simulators and workstations exchange data about their own state relative to a common virtual environment over the FDDI network. The Distributed Interactive Simulation standard prescribes the protocol for the information exchanged. This standard is based on the premise that each network node contains its own copy of the virtual environment and can display a correct view of that environment if it is periodically provided a status report on the state and activities of all other network nodes or entities. An Evans and Sutherland Image Generator 4530 (ESIG 4530) generates the visual scene for each manned module, as well as the visual images for the AARs. Two-dimensional representations of the battlefield are supplied to some of the applications of the Plan View Display (PVD). In addition to local exchange of data, the CCTT system has the ability to exchange data with external simulations via a Long Haul Network (LHN) connection.

1.1 MANNED MODULES

A Manned Module (MM) is designed to replicate a real-world combat vehicle or entity. These MMs provide near real-world physical fidelity. In addition to simulating weapon systems and maneuvering, the MMs also feature binoculars, night vision goggles, and Single-Channel Ground-to-Air Radio Systems (SINCGARS) with two radios per module. The weapon systems include thermal sights and night vision modes.

The platforms that are currently simulated by the CCTT Manned Modules are:

- M1A1 Tank
- M1A2 Tank
- M2A2/M2A3 Bradley Fighting Vehicle (BFV)
- Dismounted Infantry (DI)
- High Mobility Multipurpose Wheeled Vehicle (HMMWV)
- M113 Armored Personnel Carrier
- M981 Fire Support Team Vehicle (FIST-V)

The tanks and Bradleys simulate a Commander's Popped Hatch (CPH) in an open protected position with 360 degrees of view. The M1A2 also has a Commander's Integrated Display (CID), a Driver's Integrated Display (DID), and a Gunner's Control Display Panel (GCDP). The FIST and DI (forward observer) modules are integrated with the Forward Entry Device (FED) to provide digital messaging capability.

1.2 AFTER ACTION REVIEW STATIONS

The After Action Review enables the AAR operator to monitor, record, play back, analyze, and report on CCTT exercises. This station is comprised of a main display, a Plan View Display, three visual monitors, four radios, a tape drive, and a printer. The visual monitors provide a panoramic 120 degree three dimensional (3D) view of the battlefield. A video switching station enables the operator to create an audio/video take-home package of the exercise on a VCR tape for soldiers.

The AAR provides a visual view of the battlefield through displays that are controlled by the operator. The eye-point (the point from which the battlefield is displayed) can be freely moved around the simulated battlefield both during recording and playback. The movements of the stealth (eye-point) are not recorded so this device operates independently of the state of the AAR. The operator can see all or any portion of the battlefield and listen to voice communications. He can also analyze the battle and see current vehicle status. During the exercise, the operator can make verbal and textual notes that are available during playback.

AAR Data Analysis and Reporting (DAR) provide statistical insight to the operator during the exercise. The DAR reports information regarding kills, damage, field of view, and fire reports. These reports can be generated for friendly forces and enemy forces for aggregate down to the individual vehicle level.

During an exercise, all network DIS PDUs are recorded, including those regarding vehicle status and position, radio transmissions, environmental data, and fire and detonation data. The operator has the choice of recording the exercise to a data tape or directly to the hard drive. An exercise recorded to the hard drive can be archived to tape for later replay or replay on another AAR station.

During playback, the exercise is recreated as it originally occurred. That is, PDUs are played back in the order that they are received so that the events in the exercise are played in the same order that they were recorded.

1.3 DISMOUNTED INFANTRY MODULE

The DI Module provides the capabilities of dismounted combat activities on the simulated battlefield. The role of the DI Module is two-fold. It provides the dismounted leaders the opportunity to practice their tactical decision-making skills in a virtual battlefield environment by leading, directing, and controlling computer generated dismounted forces. It also enhances the training experience of the tactical vehicle crews by providing dismounted combat activity on the simulated battlefield.

The DI Module simulates a computer generated dismounted infantry or scout force. User inputs are provided through multi-function joysticks, computer menu interfaces, and a PVD electronic map. It processes the various inputs from the user to determine the simulation response.

1.4 MASTER CONTROL CONSOLES / MAINTENANCE CONSOLES

The Master Control Console powers up and initializes workstations and modules, provides built-in test (BIT) execution, performs exercise monitoring and control (including the insertion of stochastic module failures, weather and other effects into a specific exercise), and displays and prints current status of the CCTT network, modules, and workstations. It provides the MCC operator with an effective environment managing one to five exercises. The physical network is monitored and controlled by the Maintenance Console. The MC can also be used for software maintenance, and for fault localization.

The MCC and the MC have similar hardware and the same set of software packages stored on disks. At any time, the MCC console is capable of performing all of the MC's functions and vice versa. To reduce the MCC operator's workload, the MC is sometimes used as a second MCC console during simultaneous multiple exercises. At all times, the MCC and MC exchange and maintain the same state data (exercise conditions, modules, and workstations status) so that if either console fails, the other console continues with the current exercises. In this case, the CCTT network functions discontinue to reduce Central Processor Unit (CPU) workloads.

The MCC also has a special Instructional Voice Channel (IVC) that the operator can use to speak to any module, group of modules or the entire site.

1.5 SEMI AUTOMATED FORCES

The Semi Automated Forces workstations provide the graphical user interface (including a PVD map) from which the operator observes the battle and commands the computer generated maneuver units. CCTT has two types of SAF workstations, opposing force (OPFOR), and the friendly or Blue Force (BLUFOR). An operator knowledgeable about enemy tactics uses OPFOR workstations to control the simulated entities comprising the opponent that a training unit will engage. Similarly, operators use the BLUFOR workstations to control emulated friendly units, which the training units would expect to find in their area of the battlefield.

1.6 COMPUTER GENERATED FORCES FARM

The Computer Generated Forces farm is a number of processors that provide the behavioral and physical modeling of the computer generated entities (typically vehicles) and units. It uses a knowledge-based approach to generate appropriate intelligent behavior through a variety of programming techniques including finite state machines based on actual military doctrine and physical performance models. Each processor, currently capable of supporting up to 60 entities, communicates with other CGF processors and

the Tactical Operations Center (TOC)/SAF workstations over the network to coordinate the automated behaviors of vehicles belonging to same unit task organization. Refer to Figure 3 for an architectural representation of the CGF farm and workstations.

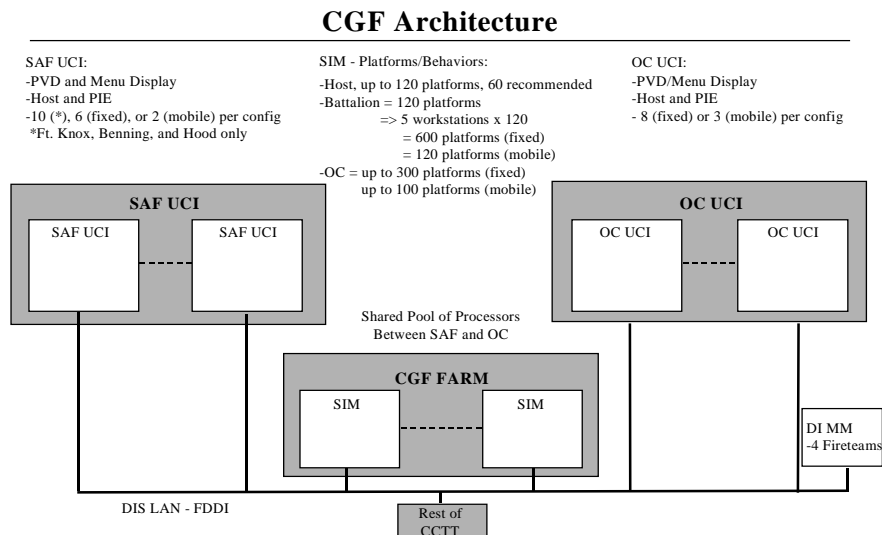


Figure 3 CCTT Architecture Diagram

1.7 TACTICAL OPERATIONS CENTER WORKSTATION

The Tactical Operations Center workstations provide graphical user interfaces for trainees or operators to command, control, and receive status on their respective TOC computer generated behavioral units. PVD maps are also provided to further monitor the tactical situation, command units, and observe the battle status

A TOC provides the emulated combat functions that a unit would call on its higher command to provide. These units include:

- Combat Engineering Support (CES)
- Combat Trains Command Post (CTCP) for logistics support
- Unit Maintenance Collection Point (UMCP) for maintenance support
- Fire Direction Center (FDC) for mortar units
- Field Artillery Tactical Operations Center (FABTOC)
- Tactical Air Command Party (TACP) for air support
- Fire Support Element (FSE) for fire control.

These workstations replicate the communications interface a staff officer would have with his supporting units. Simulated SINCGARS radios are utilized to communicate to manned units, SAF operators and other TOC officers.

1.8 ENVIRONMENT MANAGER

The Environment Manager (EM) provides the capabilities to support simulation of dynamic environment objects. These dynamic environment objects include pre-positioned objects, relocatable objects, and tactical smoke. Pre-positioned objects include buildings and bridges that may be damaged and/or destroyed. Relocatable objects include obstacles (such as tank ditches, log cribs, abatis, minefields, and craters), fighting positions (such as vehicle defilades and infantry fighting positions), passageways (such as AVLBs and ribbon bridges), and other miscellaneous objects (such as minefield markers and minefield breaches). The EM adheres to the Synthetic Environment Protocol, which defines three PDUs to manage the dynamic environment objects: Point Object State PDU, Linear Object State PDU, and Areal Object State PDU. Other simulation applications communicate with the EM via the FDDI network using the DIS PDUs. The services provided by the EM include creation and modification of relocatable objects, damage assessment on pre-positioned and relocatable objects, modeling of tactical smoke, and provision of Object State PDUs in support of reset and latecomers to the exercise.

The EM provides the capability to run an Environment Manager application process in primary mode or backup mode. Thus, a backup process may be run to support a given primary process on another machine. In primary mode, an Environment Manager application process provides the functionality described above. The process being run in backup mode may take over the functionality of the process being run in primary mode upon direction from the MCC/MC, without interruption of the ongoing exercise.

2. OPERATIONAL CAPABILITIES

Operational capabilities are defined as the subset of the unit / collective tasks that can be performed wholly, or in part, within the CCTT environment by the training audiences in the manned modules and the workstations. Clearly, if the task cannot be performed by the CCTT, there is little need to establish an interoperable interface with CCTT in an attempt to support the conduct of the task. In this sense, the operational capabilities bound the problem of interoperability as it relates to CCTT.

2.1 TASK PERFORMANCE SUPPORT CODES

The Task Performance Support Codes (TPSC) describe the relative capacity of CCTT to support the performance of collective tasks as defined by the Army Training and Evaluation Program (ARTEP) Mission Training Plans. TPSC was developed to assist materiel developers in designing or improving simulation systems. Applied to a single simulation system like CCTT, the TPS codes serve two functions. First, the codes establish a baseline of operational expectations that satisfy both the user needs and technical affordability. Second, the codes highlight those collective tasks that are not supported by the current simulation system design and which future improvements may be warranted.

Taking a broader view, the TPS codes, applied to a family of simulations, can highlight functional strengths and weaknesses in the Army's capability to support collective training in all Battlefield Operating Systems (BOSs). The codes can also support Verification, Validation and Accreditation (VV&A) and operational testing by providing a collective task baseline against which to test functional capabilities.

The tasks supported by CCTT fall into two groups for the primary and secondary training audiences. The primary audience is trained predominantly in the CCTT manned modules. Manned modules are full crew simulators for the M1 Abrams tank, the M2/M3 Bradley Fighting Vehicle, the M113 Armored Personnel Carrier, the M981 Fire Support Vehicle and the High Mobility Multi-Purpose Wheeled Vehicle. These vehicles constitute the majority of vehicles found in tank and mechanized infantry units

on the battlefield. The second training audience is composed of those individuals working at the various workstations that emulate command posts or TOCs. For the most part, the tasks associated with the secondary audience are leader or individual staff position tasks. The TPS Codes do not currently evaluate the capabilities of the CGF portion of the CCTT; however, a cross-match between TPS codes for the primary training audience tasks and CCTT SAF capabilities will be provided for BLUFOR in APPENDIX F – CIS TO TPSC.

The Subject Matter Experts (SMEs) who conducted the performance measure evaluations provided comments for shortfalls of CCTT manned modules that lead to TPS codes not, or minimally, supported. In payoff order, the top ten limiting factors are as follows.

- 1) Mortar Ballistics Computer (MBC) Operations
- 2) Dismounted Individual Combatants capability (other than from the DI manned module).
- 3) Manipulated Systems (e.g., personnel reporting, maintenance, supply)
- 4) Enemy Prisoner of War (POWs) (e.g., handling searching interrogating)
- 5) Evacuating prisoners, those Killed in Action (KIAs)
- 6) Emplacement of obstacles, alarms, weapons systems (other than from Combat Engineering workstations)
- 7) Performing maintenance (other than from UMCP workstation)
- 8) Camouflaging vehicles, equipments, areas, and weapons
- 9) Medical treatment and evacuation
- 10) Performing pre-combat checks (other than checks from within the manned modules.)

2.2 CGF CAPABILITIES

The CGF capability of the CCTT supplements the manned module simulators with sufficient friendly and enemy forces to provide a complete combined arms training environment for the tank / mechanized infantry battalion task force. The CGF entities, whose behaviors are modeled by the CCTT computer software, are capable of operating as independent elements or as supplements to the manned modules. The units are under limited operator control at the Semi-Automated Forces consoles.

The behavior models for the CGF entities are described in the natural language Combat Instruction Set (CIS) documents. The CISs were derived through the conversion of the current training and doctrinal literature into a structured, formatted description of how a training task is to be performed. For BLUFOR entities, the CISs are based on current doctrine and tactics from the ARTEP MTPs. For OPFOR entities, the CISs are based on foreign military publications and the U.S. Army Training and Doctrine Command (TRADOC) OPFOR Heavy Guide. Please refer to Appendix F for a CIS listing. Additional doctrinal references are used for OPFOR behaviors, since training standards do not exist for OPFOR entities.

3. VERIFICATION, VALIDATION AND ACCREDITATION (VV&A)

VV&A performed on the CCTT was to provide the accrediting authority with sufficient information for determining that the CCTT conforms to its intended purpose and use. The CCTT VV&A team was responsible for planning and conducting verification and validation on the combination of components that comprise the CCTT and its training exercises. It included experts in these procedures and independent evaluators. Representatives from the following organizations made up the team: TRADOC Training Systems Manager (TSM) CATT, Army Training and Doctrine Command Analysis Center-White Sands (TRAC-WSMR), Army Threat Support Directorate (TSD), Army Simulation, Training, and Instrumentation Command (STRICOM), Army Test and Evaluation Command (TECOM), Army Materiel

Systems Analysis Activity (AMSAA), Communications-Electronics Command (CECOM) Software Engineering Directorate-STRICOM Support Office (SED-SSO), and Support Contractors: Nations, Sherikon, and Resource Consultants. The purpose of accreditation is to officially determine that the CCTT capabilities meet the intended use. The accreditation methodology's focal point is CCTT's ability to provide realism in operational training. The baseline for CCTT's ability to support training is enumerated in the TPSCs. These are based upon the implementation of CISs, the simulated visual cues from the visual databases, and the manned modules' fidelity and operating skill cues.

CCTT testing included task and fidelity analyses, verification of CISs, hardware fidelity verification, user exercises for each build and implementation algorithm verification to assure that the data, models, and algorithms are approved and that the appropriate data, models and algorithms were implemented in the CCTT. With respect to verification activities, the traceability of all CCTT requirements was verified to ensure consistency between documentation. Validation is the rigorous and structured process of determining the extent to which CCTT accurately represents the intended real world from the perspective of its intended use as a training device. Since verification and validation are complementary processes, some results from the tests used in verification were used as inputs to the validation process.

CHAPTER THREE – INFRASTRUCTURE

The most basic characteristic of interoperability is the ability to share data between simulations. Once the ability to share data has been achieved, care must be taken to ensure that the data itself can be read and understood in a consistent manner. This section of the document details the requirements for the successful delivery and consistent assimilation of the simulation data, independent of the data values themselves. It includes such things as connecting to the host network, collecting relevant data from that network, and perceiving time within established tolerances.

1. PHYSICAL CONNECTIVITY

Central to physical configuration of CCTT architecture is the local-area network, which provides the communication infrastructure. The CCTT DIS network has been implemented using FDDI networking media and network adapters that support (on-card) sixty-four multicast group addresses. Although its utilization of TCP/IP protocols provides CCTT the capabilities to execute on networks other than FDDI, this network medium was selected for use by fielded CCTT sites including mobile CCTT trailers. Thus, in order to interoperate with CCTT, one will be required to connect to CCTT FDDI concentrators.

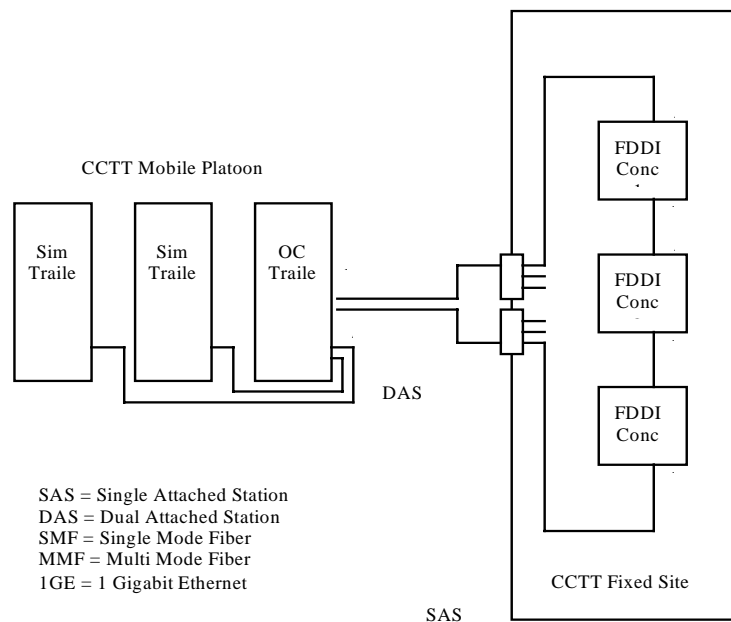


Figure 4 CCTT Connectivity Diagram

2. DATA PACKAGING AND TRAFFIC SEGMENTATION

CCTT networks consist of up to eighty-two host processors connected by multi-mode fiber-optic cables connected through FDDI concentrators. All the host processors are based upon the PowerPC chip executing the AIX (UNIX) operating system. All data is passed between simulations using standard transmission protocols. For point-to-point communication, the reliable Transmission Control Protocol (TCP) is used, while the "best effort" User Datagram Protocol (UDP) is used to send multicast and broadcast data. To be interoperable with CCTT, a simulation must implement its communication mechanism so that it is able to send and / or receive data under such circumstances.

The use of broadcasting data is kept to a minimum in order to minimize the impact of interrupts to any host processor being utilized for an exercise. Broadcast is only used prior to a simulation application's being assigned to an exercise. MCC initially communicates via broadcast to determine the health of a processor/application, but switches to multicast communication with the application after having sent the application the Create Entity PDU. Additional information on this interaction is located in the Simulation Management section.

Point to point traffic is most often used by MCC to communicate data that is specific to one configuration/application, such as the Simulation Management PDUs Create and Action Request PDUs, which communicate initial stores. The CCTT manned simulators also use point-to-point when the destination is specifically known, such as for logistics and maintenance requests.

To reduce network traffic and to support in excess of fifteen hundred entities, CCTT employs PDU concatenation, data region Areas of Interest (AOI), IP Multicast, and "smart" network adapter cards to reduce the amount of computer resources used in sending/receiving DIS PDUs. Please note that the "smart" card is a performance enhancement and not a requirement placed on interoperating simulators.

Early analysis in CCTT showed that the number of interrupts distressing the host processor could be dramatically reduced, particularly from a CGF processor if PDU concatenation were enabled and supported. PDU concatenation entails laying a number of PDUs end-to-end within a single network packet. The network interface in CCTT is controlled via data file to automatically perform PDU concatenation. To perform this it batches PDUs via periodic transmissions.

The packets in CCTT are never allowed to grow larger than the Maximum Transmission Unit (MTU) of the network on which CCTT is connected in order to prevent fragmentation of the packets and to adhere to the IEEE standard 1278.1-1995. For all current CCTT sites this is FDDI and the MTU is 4352 bytes. With header information, the maximum data, which is allowed in a packet, is restricted (by CCTT) to 4096 bytes. Simulations attempting to interoperate with CCTT must be prepared to handle connection to a FDDI, as well as multicast addressing and PDU concatenation.

IP Multicast is a COTS Software implementation that supports the abstraction of Multicast Groups. CCTT developed an implementation of multicast groups that allows applications to register for any or all of the multicast partitions. With a five concurrent exercise requirement, and desired growth to 31 exercises, CCTT defined five partitions of DIS PDU traffic:

Exercise Traffic -- Exercise specific PDUs (anything other than those special cases that follow).

CGF Traffic -- The Computer Generated Forces Protocol Family of PDUs (within each active exercise).

Location Sensitive Traffic -- Entity Information and Warfare Protocol Families of PDUs (within each active exercise).

Radio Traffic -- Signal PDUs (a set of radio network groups within each active exercise).

Special Case Traffic -- When the intended PDU receiver need not be assigned to a specific Exercise Id: (a) The Create Entity PDU (which is used to make the assignment of an exercise to an awaiting application process), (b) Any PDU using the All Exercise Id or the Null Exercise Id.

The following Table I shows the PDU/protocol family and the logical partition it is sent in on the CCTT network. Definitions of how the multicast address is constructed for each partition, exercise, location, and radio net follows.

Table I. . Application Specified Method and Attributes Required In Qualifying A PDU Send Request			
PDU Protocol Family / Comments	Logical Partition	Method	Qualifying Attributes
Computer Generated Forces (all seven PDUs)	CGF Traffic	Multicast	(1) + CGF Traffic Id
Distributed Emission Regeneration (both PDUs)	Exercise Traffic	Multicast	(1, 2)
Entity Information / Interaction (both PDUs): Collision PDU Entity State PDU	Location Sensitive Traffic	Multicast	(1) + XY location
Logistics (all six PDUs)	Exercise Traffic	Multicast	(1, 2)
Radio Communication (except Signal PDU)	Exercise Traffic	Multicast	(1, 2)
Radio Communication (Signal PDU)	Radio Traffic	Multicast	(1) + Radio Net Id
Simulation Management (except Create Entity)	Exercise Traffic	Multicast	(1, 2)
Simulation Management (Create Entity PDU)	Special Case Traffic	Broadcast or Point-to-point	(3)
Synthetic Environment Protocol (all three PDUs)	Exercise Traffic	Multicast	(1, 2)
Warfare (both PDUs): Detonation PDU Fire PDU	Location Sensitive Traffic	Multicast	(1) + XY location
Any PDU with the All Exercise ID or the Null Exercise Id	Special Case Traffic	Broadcast or Point-to-point	(3)

(1) Exercise Id is used in building (as described within this document) the associated Multicast Group Address.

(2) There are no "qualifying attributes" for Broadcast Send. For Point to Point Send, the target adapter's IP address and port number must be provided.

The Multicast Send requests of PDUs from the Location Sensitive Traffic partition are qualified by the entity's location (entity state PDU) or event's location (collision PDU, detonation PDU or fire PDU) at send time. This location is defined as a tuple¹ (x kilometers, y kilometers) and specified in UTM relative coordinates for the current database. 0...255 is the allowable range of x and y. Coordinates are relative to the lower-left corner of the database.

¹ Tuple: A collection of data values and positions such as an enumeration or record type.

These XY locations are converted to cell addresses. The terrain is partitioned into 'n' square cells, where the number of cells is determined by the size of the terrain and a (environment variable) specified cell (or grid) size. CCTT currently uses a 5 kilometer square cell. The following diagram illustrates how the grid would overlay the terrain and form the corresponding x,y cell. Each cell thus maps to a tuple (a unique numeric identifier) based on the grid location along the x and y axis, starting in the lower left hand corner.

0,6	1,6	2,6	3,6	4,6	5,6	6,6	7,6			
0,5	1,5				5,5					
0,4	1,4			4,4						
0,3	1,3	2,3	3,3							
0,2	1,2	2,2	3,2	4,2	5,2					
0,1	1,1	2,1	3,1	4,1	5,1	6,1	7,1			
0,0	1,0	2,0	3,0	4,0	5,0	6,0	7,0	8,0	9,0	10,0

Figure 5 Sample Of Cell Addresses Defined Over A Terrain

For internal data representation CCTT uses the byte ordering sequence known as “Big Endian”. In this architecture all multi-byte numeric representations are stored so that the most significant byte has the lowest address.

3. MULTIGROUP ADDRESSING WITHIN CCTT

The standard IP addresses of TCP/IP are partitioned into four classes plus one reserved for future addressing use. These classes correspond to four byte internet addresses made up of two separate fields. These fields are the network address field and the station or machine address field. The following diagram outlines the nature of the different classes:

	<-- 1 byte -->	<-- 1 byte -->	<-- 1 byte -->	<-- 1 byte -->	
Class A	network no.	station or machine no.			
Class B	network no.	station or machine no.			
Class C	network no.	station no.			
Class D	Multicast group address				
	<-- 1 byte -->	<-- 1 byte -->	<-- 1 byte -->	<-- 1 byte -->	

For example, the CERN main ethernet network address is 141.128 and a whole internet address is 128.141.1.99.

Class D addresses are restricted to have the high order four bits set to 1110. Host group addresses are in the range 224.0.0.0 to 239.255.255.255 where 224.0.0.0 is guaranteed not to be a member of a group and 224.0.0.1 addresses all multicast group members. Class E addresses are reserved for future use and the first four bits are set to 1111.

Class D addresses are reserved for multicast addresses. IP addresses are 32 bits wide with the high order bits used to identify the IP class (4 bits for class D addresses). The remaining 28 bits can be used for multicast addresses. Due to limitations with respect to Ethernet addresses, only the low order 23 bits will be utilized in IP Multicast.

The Ethernet directly supports the sending of local multicast packets by allowing multicast addresses in the destination field of Ethernet packets. All that is needed to support the sending of multicast IP datagrams is a procedure for mapping IP host group addresses to Ethernet multicast addresses.

An IP host group address is mapped to an Ethernet multicast address by placing the low-order 23-bits of the IP address into the low-order 23 bits of the Ethernet multicast address 01-00-5E-00-00-00 (hex). Because there are 28 significant bits in an IP host group address, more than one host group address may map to the same Ethernet multicast address.

As described in earlier sections of this document, CCTT has established logical partitions of multicast PDU traffic. Further, CCTT needs a wide partition (large number) of multicast group addresses to support the mapping of numerous, small geographical regions within each of up to five concurrent exercises to unique multicast groups. Table II shows the mapping of these logical partitions to their multicast group address ranges.

Table II. CCTT Multicast Group Address Ranges For Logical Traffic Partitions		
Logical Traffic Partition	Address Range (1) (2)	Comments
Exercise Traffic	0xE0000700 .. 0xE00007FF	One group per exercise
CGF Traffic	0xE0000800 .. 0xE00008FF	One group per exercise
Location Sensitive Traffic: All Location Sensitive Group XY cell Id	0xE0000900 .. 0xE00009FF	One group per exercise
Special Case Traffic	0xE0030000 .. 0xE07FFFFF	Supports 65,536 cell addresses per exercise. Maps from XY to an address.
Radio Traffic	0xE000C000 .. 0xE000FFFF	Supports 64 groups per exercise. Maps from radio net Id to an address.

(1) 0xE0 specifies the Class D, IP Multicast Group Address format.

(2) For Location Sensitive XY cell Id traffic, a 5-bit limit is imposed for Exercise Id (0x007C0000). In all of the other cases, the low order 8-bits is used to contain the Exercise-Id value.

For example, for location sensitive traffic, if the location of an Exercise Id 7 entity were determined to be in a geographical region located inside the cell (grid) identified by the tuple (3,2), the resulting multicast address would be derived as follows:

1. The L value = 0xE0030000 = Location Id bits for this traffic partition.
2. The E value = 0x001C0000 = (Exercise Id shifted left 18 bits) AND'ed with 0x007C0000
3. The X value = 0x00000300 = (X shifted left 8 bits) AND'ed with 0x0000FF00
4. The Y value = 0x00000002 = (Y) AND'ed with 0x000000FF
5. Result = 0xE01F0302 = L value, E value, X value and Y value; OR'ed together

Location Sensitive Traffic-Location Sensitive Traffic is characterized by the following PDUs:

-- Entity Information Interaction

Collision PDU

Entity State PDU

-- Warfare Protocol Family

Detonation PDU

Fire PDU

Radio Traffic-The Radio Net Id is currently mapped to a single multicast group. To be more specific, the Signal PDUs are mapped to a single multicast group. Transmitter PDUs are sent and received along with Exercise Traffic. All users of radios must receive transmitter PDUs in order to determine which Signal PDUs the application is interested in. Once this has been determined, the application will join the multicast group to receive the Signal PDUs associated with the specified Radio Net. As noted earlier, CCTT is mapping all Signal PDUs to a signal multicast group, but allows this to be easily expanded to as many as 64 unique groups. CCTT decided to limit Radio Traffic to a single group in order to allow the greatest possible filtering of Location Sensitive Traffic on the FDDI adapter. The current FDDI adapters support a 64 multicast group address on the adapter itself. By limiting Radio Traffic to one multicast group, the remaining Contiguous??? Addressable Memory (CAM) addresses can be used to support Location Sensitive Traffic. CAMs that support 64 multicast groups seem to be the upper limit given the adapters available at this time. However, it is expected that future adapters will grow beyond this and we would like to be able to exploit these future adapters with little impact to CCTT software.

Radio Traffic is characterized by the following PDUs:

-- Radio Communication Protocol Family

Signal PDU

Exercise Traffic-Exercise Traffic is characterized by the following PDUs:

-- Distributed Emission Regeneration

Designator PDU

Electromagnetic Emission PDU

-- Logistics Protocol Family

Repair Complete PDU

Repair Response PDU

Resupply Cancel PDU

Resupply Offer PDU

Resupply Received PDU
Service Request PDU

- Synthetic Environment Protocol
 - Areal Object State PDU
 - Linear Object State PDU
 - Point Object State PDU
- Simulation Management
 - Acknowledge PDU
 - Action Request PDU
 - Action Response PDU
 - Data PDU
 - Data Query PDU
 - Event Report PDU
 - Message PDU
 - Remove Entity PDU
 - Set Data PDU
 - Start Resume PDU
 - Stop Freeze PDU
- Radio Communication Protocol Family
 - Intercom Control PDU
 - Intercom Signal PDU
 - Receiver PDU
 - Transmitter PDU

CGF Traffic—CGF traffic is characterized by the following PDUs:

- Computer Generated Forces (CGF) Protocol Family
 - Announce Object PDU
 - Delete Object PDU
 - Describe Application PDU
 - Describe Event PDU
 - Describe Object PDU
 - Request Event PDU
 - Request Object PDU

Special Case Traffic—Special Case traffic is characterized by the following Broadcast or Point-to-Point PDUs:

- Simulation Management
 - Create Entity PDU
- Any PDU with All Exercise Id or Null Exercise Id

4. TIME SYNCHRONIZATION

Time synchronization is of major importance to interoperating simulations. The purpose of time synchronization is to provide and maintain a perception of Universal Coordinated Time (UTC), which is consistent relative to the population of processors participating in a given exercise. Each CCTT host processor runs a timed process, which is provided as part of AIX. A master-slave relationship exists among the population of processors with at least one processor designated as the master and the remaining processors designated as candidate masters or slaves that could succeed the master.

In order to synchronize processors times throughout each site, the standard time daemon (timed) provided with AIX is used.

An algorithmic objective of time synchronization is to provide/maintain a time delta value per processor; such that the delta, combined with a processor's current clock time, produces synchronized UTC. This allows for minor, infrequent, modifications relative to the time delta value, and transmission delays, which do not interfere with synchronization. In CCTT, the processors are all synchronized to within +/- 20 milliseconds.

The network time protocol is used to synchronize the hardware of operating system clocks between all the host processors. The CCTT applications assume the clocks are synchronized correctly when receiving and processing messages containing time references, such as Simulation Management start and stop requests.

Capability Area: Infrastructure														
Chap	ICD Paragraph Title	Capability Detail	Testable Attribute	Attribute Test Sequence	Entry Level Test /Exit Level					Test Approach			Manual Test Method Available	Test Notes
					1	2	3	4	5	DIS Tool Test	Inspection during exercise	Output/Visual Inspection		
	Physical Connectivity	Support a Network connection	Network Connectivity		0	N/A	N/A	N/A	N/A		Y			If application can be physically connected to network without causing disruption to network. If network operations disrupted, application does not meet level-1.
	Data Packaging and Traffic Segmentation	Participating simulation systems shall adhere to IEEE standard 1278.1	Network Connectivity	2.1	N/A	1	N/A	N/A	N/A	Y				PDU sent and received conform to the format and associated enumerations for the family of PDUs.
		A simulator system shall support PDU Concatenation	Concatenated PDUs	2.2	N/A	1	N/A	N/A	N/A	Y				
		Maximum Transmission Unit (MTU) of the network on which CCTT is connected shall be 4352 bytes with 4096 bytes of data.	Network Packet size	2.3	N/A	1	N/A	N/A	N/A	Y				
		Siman PDUs conforms to structure, values and enumerations	CCTT DIS enumerations	3.1	N/A	N/A	2	N/A	N/A	Y				MCC will not send SIMAN PDUs to applications which do not map directly to a CCTT configuration type.
		Supports MCC protocols, Power-On/Off.	SIMAN Protocols	5.1	N/A	N/A	N/A	N/A	4	Y				Receive and Respond to Action Request PDUs.
		Supports MCC protocols, Initial Conditions.	SIMAN Protocols	5.2	N/A	N/A	N/A	N/A	4	Y				Receive and Respond to Action Request PDUs.
		Support Big Endian byte ordering.	big_endian	2.4	N/A	1	N/A	N/A	N/A	Y				
	Multicast Groups within CCTT	Exercise specific data shall be sent and received on multicast groups reserved to Exercise specific traffic.	multicast_exercise_traffic_group	3.2	N/A	N/A	2	N/A	N/A	Y				Exercise specific POUs identified in section 3.4 will be sent and received on multicast groups as described in section 3.1. Test should verify traffic sent on appropriate multicast groups.
		CGF Family of PDUs shall be sent and received on multicast groups reserved to CGF PDU traffic	multicast_cgf_traffic_group	N/A	N/A	N/A	N/A	N/A	N/A	Y				CGF specific PDUs identified in section 3.5 will be sent and received on multicast groups as described in section 3.1. CGF traffic are unique to CCTT SAF/CGF and should not be sent or received by other applications

Capability Area: Infrastructure														
Chap	ICD Paragraph Title	Capability Detail	Testable Attribute	Attribute Test Sequence	Entry Level Test /Exit Level					Test Approach			Manual Test Method Available	Test Notes
					1	2	3	4	5	DIS Tool Test	Output/Visual Inspection during exercise	Code and/or Data File Inspection		
	Multicast Groups within CCTT	The location sensitive PDUs shall be sent and received on multicast groups reserved to Location sensitive PDU traffic	multicast_location_traffic_group	3.3	N/A	N/A	2	N/A	N/A	Y				Location sensitive PDUs identified in section 3.2 will be sent and received on multicast groups as described in section 3.1. Test should verify traffic sent on appropriate
		Radio traffic PDUs shall be sent and received on multicast groups reserved to radio PDU traffic	multicast_radio_traffic_group	3.4	N/A	N/A	2	N/A	N/A					Radio PDUs identified in section 3.3 will be sent and received on multicast groups as described in section 3.1. Test should verify traffic sent on
		Special case PDUs shall be sent and received on multicast groups reserved to special case PDU traffic	broadcast_siman	3.5	N/A	N/A	2	N/A	N/A	Y				Special case PDUs identified in section 3.6 will be sent and received on multicast groups as described in section 3.1. Test should verify traffic sent on appropriate multicast groups.
		Can support thresholds, update rates, etc.	multicast_cgf_traffic_group	4.1	N/A	N/A	N/A	3	N/A					Dead reckoning applied such that differences between CGF and Mdules not discernable. Multicast does not check current group
		Can support CCTT fidelity, exercise size,	multicast_cgf_traffic_group	5.3	N/A	N/A	N/A	N/A	4					850 Entity exercise with 50% reserve and 1700 without reserve capacity.
		Support Data Region Area of Interest	data_region_aoi	N/A	N/A	N/A	N/A	N/A	N/A					
		Support IP Multicast	ip_multicast	N/A	N/A	N/A	N/A	N/A	N/A	Y				CCTT FDDI cards support 64 multicast groups. It is sufficient for target application to choose what they want as long as they properly map PDUs to multicast groups.
	Broadcast or Point-TO-Point within CCTT	Support CCTT broadcast.	broadcast_siman	3.6	N/A	N/A	2	N/A	N/A	Y				
			broadcast_exercise_id_null	3.7	N/A	N/A	2	N/A	N/A	Y				
			broadcast_exercise_id_all	3.8	N/A	N/A	2	N/A	N/A	Y				
		Support CCTT point-to-point.	point_to_point	3.9	N/A	N/A	2	N/A	N/A					
	Time Synchronization	Maintain time synchronization with CCTT using NTP.		3.10	N/A	N/A	2	N/A	N/A		Y			Verify timed configuration
		A simulation application shall maintain REAL WORLD TIME within a 20ms tolerance of the CCTT system.		3.11	N/A	N/A	2	N/A	N/A		Y			Use timedc to verify delta between master and target host

CHAPTER FOUR – SIMULATION MANAGEMENT

The following state diagram in Figure 6 is referenced throughout the simulation management section to help explain what simulation applications in CCTT are allowed to perform during and after various simulation management events have occurred. It is not necessary that interoperable simulations match these states, only that they perform and/or acknowledge those events required to enter into each state and that while in the state they perform in a way indistinguishable from a CCTT simulation application.

When CCTT applications start they enter the wait state. All CCTT applications except for MC/MCC, SAF workstations, and AAR auto-start when their host processor boots. This is in response to two requirements: single user initialization and password protection for SAF, AAR, and MCC/MC. Any interoperable simulator which is not a SAF, MC/MCC, or AAR must also auto-start. When the applications auto-start or are brought up by logging in using a password, they automatically enter the wait state depicted in the figure below.

Typically an application can expect to receive an action request querying for their power on self-test (POST) results at some point in this state. The application must respond with a valid POST answer or they will be marked down and unable to be brought into an exercise. Should they respond with a valid status they are then eligible to be initialized into a CCTT exercise. The daily readiness state is also ordered via an action request. The simulation application must respond with a complete action response and should then exercise any lights, gauges, and speakers in a repetitive manner until ordered to stop.

When the simulation is being initialized into an exercise it will receive a create entity PDU, must acknowledge it, and will then receive seven separate action request PDUs to which it must respond (executing and/or complete). The simulation will then be considered to be in the stopped/frozen state during which it must only respond to simulation management PDUs. Once all simulation assets in the exercise have been created and have processed all action requests (all are complete) the exercise will be started via the start resume PDU. At that time the simulation applications are all in the simulating state and may issue and respond to all 2.04R standard PDUs as well as the extended set of PDUs recognized by CCTT.

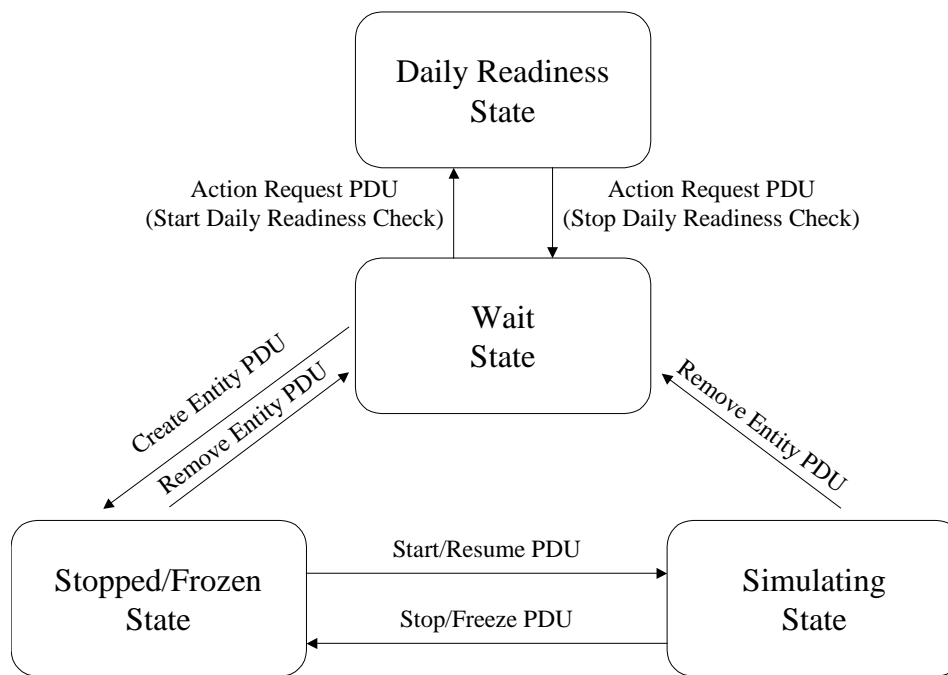


Figure 6 CCTT Simulation State Diagram

1. PDU PROTOCOLS

1.1 ACTION REQUEST / ACTION RESPONSE PDUS

The CCTT Master Control Console (MCC) and Maintenance Console (MC) utilize Action Request/Action Response PDU's in order to request that a simulation application perform a specific action (See Figure 7). The simulation manager initiates the protocol by sending the simulation application an Action Request PDU with a requested action identifier. The simulation application responds to the Action Request PDU from the simulation manager by sending an Action Response PDU within ten seconds of the Action Request PDU time stamp. The simulation application specifies the current request status when it sends the Action Response PDU to the simulation manager. While the simulation application is executing the request, the simulation manager periodically requests the status of the original request by sending an Action Request PDU specifying the status request action identifier. The request identifier in the Action Request PDU is used to correlate the status request to the original request. The simulation application responds to the status request Action Request PDU by sending an Action Response PDU with the current request status within ten seconds of the Action Request PDU time stamp. The simulation application sends an Action Response PDU with a complete status to the simulation manager when the application has completed the requested action. This Action Response PDU may or may not be in response to a status request Action Response PDU. (Refer to individual application sequences for specific Action ID requirements.) Details of the action requests and associated enumerations may be found in Appendix E.

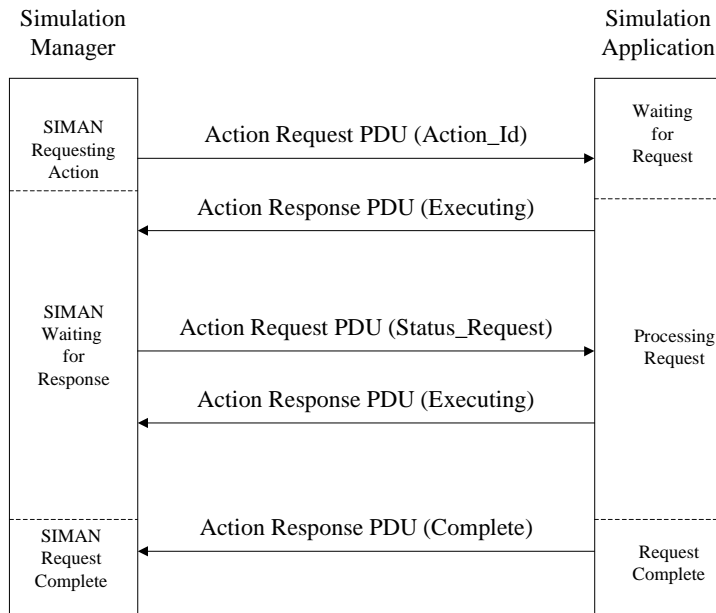


Figure 7 Action Request Event Flow Diagram

The simulation manager sends action requests with the following action identifications:

- Data Query
- Self Test Status Record
- Local Storage of the Requested Information
- Recall Checkpoint Data
- Checkpoint Reset Record Time ID
- Recall Initial Parameters
- Reconstitute
- Start Daily Readiness Check
- Status Request
- Stop Daily Readiness Check
- Teleport Entity
- Teleport Entity ID

1.2 CREATE ENTITY PDU

The CCTT Simulation Manager sends the Create Entity PDU to the simulation application in order to assign the application to the specified exercise. The simulation application acknowledges the Create Entity PDU by sending an Acknowledge PDU to the simulation manager within ten seconds of the Create Entity PDU time stamp. The CCTT simulation manager does not control the creation of simulated entities; therefore, the entity identifier in the Create Entity PDU receiving entity ID is set to zero indicating the application must select its own entity identification and create the entity or entities. The simulation application is responsible for creating and managing simulated entities as applicable for its application type. The simulation application is capable of operating in any valid DIS exercise number. A

simulation application transitions to the Stopped/Frozen state when it acknowledges the Create Entity PDU (See Figure 8).

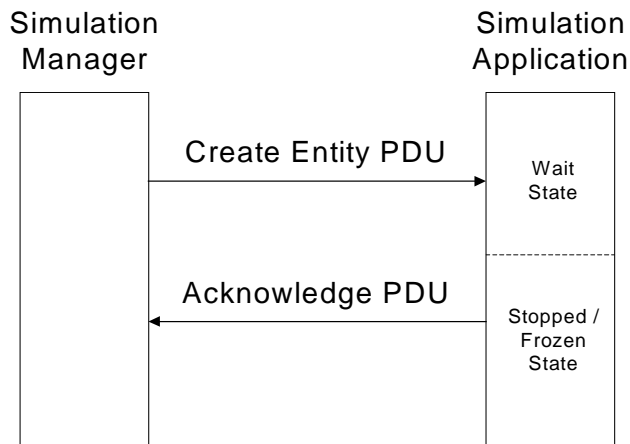


Figure 8 Create Entity Event Flow Diagram

This section addresses the creation of entities in the CCTT system, the identification of CCTT entities via the Entity Identifier Record, and the ranges of numbers to be used in CCTT for the Application ID field of the Entity Identifier Record.

1.3 ENTITY CREATION / IDENTIFICATION

There are two methods by which entities are created in CCTT. These are direct and indirect. In direct entity creation, the simulation manager issues a Create Entity PDU. This PDU contains fields specifying the Originating Entity and the Receiving Entity. The receipt of a Create Entity PDU requires the Receiving Entity to return an Acknowledge PDU to the Originating Entity.

Indirect entity creation, an Entity State PDU is received by a simulation application for an entity that not previously created. The new entity identifier is contained in the Entity ID record of the Entity State PDU. This primarily is used with guided munitions in CCTT and is discussed under the synthetic natural environment section.

An entity's identifier record in CCTT is composed of three 16-bit unsigned integer fields: Site ID, Application ID, and Entity ID. CCTT is assigned a specific set of site IDs. Simulation applications may always determine the site number to use by reading the configuration file at the site they are installed. The file is installed under /MCC/config, which is a shared NFS file system. The simulation manager uses the reserved Site IDs for specific purposes. Site ID= 0 means "no site". A Site ID = 216-1 means "all sites", and Site ID= 216-2 has no meaning, but is reserved for consistency.

Each simulation application at a DIS site is assigned an application identifier unique within the site. This is also a part of the file installed under /MCC/config. No application is assigned an application

identifier equal to 0, $2^{16}-1$ or $2^{16}-2$. The simulation manager uses the reserved application identifiers for specific purposes. Application identifier equal to 0 implies “no application”. An application identifier equal to $2^{16}-1$ means “all applications”, and an application identifier equal to $2^{16}-2$ has no meaning, but is reserved for consistency.

Each entity in a given exercise executing on a DIS application is assigned an entity identifier unique within the application. No entity is assigned entity identifier equal to 0, $2^{16}-1$ or $2^{16}-2$. The simulation manager uses the reserved entity identifiers for specific purposes. Entity identifier equal to 0 means “no entity”. An entity identifier equal to $2^{16}-1$ means all entities within the specified site and application, and an entity identifier equal to $2^{16}-2$ allows the simulation application receiving a Create Entity PDU to define the Entity ID of its new entity. The newly assigned entity ID is returned to the simulation manager in the Acknowledge PDU. The $2^{16}-2$ method is the one used by CCTT.

1.4 ENTITY ID NUMBERING

Entity identifier record numbering must be such that the entity ID numbers do not collide with the entity ID numbers used by other entities. This situation is applicable to those “entities” created by the simulation manager who, in turn, then create the real entities seen in the virtual battlefield. These are namely: Dismounted Infantry, the CCTT HMMWV, SAF, and OC. For example, the MCC sends an entity identifier composed of a Site identification number, an Application identification number and an “assign it yourself” entity identification number to the DI module. The DI module “creates”, through the issuance of an Entity State PDU, individual soldier entities having entity identifier records composed of the same Site ID and Application ID numbers, but with different entity IDs for each of the individual soldier entities. Should one of these soldier entities fire a munition for which tracking data is required, an entity identifier record for the munition entity will be needed. The munition entity identifier record will be composed of the same Site and Application ID fields as the soldier entity, but contain an entity ID field number that is currently unused. If a second individual soldier entity then fires a guided munition, it will need a new munition identifier record which does not overlap with any of the existing soldier or DI architectural entity identifier records, and which does not overlap with any of the munition entity identifier records for any munition currently in use.

1.5 APPLICATION IDS FOR USE IN CCTT

The following architecture for the Application ID numbers is used within CCTT. Each simulation application is assigned a unique application number associated with each instantiation of the application in a CCTT system. For example the two HMMWV modules in the current Fixed Site module mix will all contain the same software object files, yet each one will be known in the simulation exercise by a different Application ID.

CCTT application identifiers range from 100 through 60999 defined as follows:

- (1) 1xx shall be used for AAR consoles, xx in the range <00,99>
- (2) 2xx shall be used for SAF UCI workstations, xx in the range <00,99>
- (3) 3xx shall be used for OC UCI workstations, xx in the range <00,99>
- (4) 4xx shall be used for MCC, MC, etc., workstations, xx in the range <00,99>
- (5) 5xx, 6xx and 7xx shall be used for DI stations, xx in the range <00,99>
- (6) 800 - 19999 are currently unused and available
- (7) 200xx shall be used for M1A1, xx in the range <00,99>

- (8) 201xx shall be used for M1A2, xx in the range <00,99>
- (9) 202xx shall be used for M2A2 and M3A2, xx in the range <00,99>
- (10) 20300 - 20399 unused
- (11) 204xx shall be used for HMMWV, xx in the range <00,99>
- (12) 205xx shall be used for M113, xx in the range <00,99>
- (13) 206xx shall be used for FIST-V, xx in the range <00,99>
- (14) 60xxx shall be used for CGF simulation applications, xxx in the range <000,999>

A characteristic of the CCTT usage of the Application ID is the ability to associate a particular Application ID to an individual host processor. Several application identifiers (and thus simulation applications) may reside in one host. No application identifier shall reside in two or more hosts.

1.6 START RESUME PDU

The CCTT Simulation Manager sends the Start/Resume PDU to a Simulation Application in order to start or resume simulation operations within the specified exercise. (See

Figure 9). The Simulation Application acknowledges the Start/Resume PDU by sending an Acknowledge PDU to the Simulation Manager within ten seconds of the Start/Resume PDU DIS time stamp. The Simulation Application transitions to the Simulating state at the real-world time specified in the Start/Resume PDU. The Simulation Application sets internal time-of-day parameters, as applicable, based on the simulation time as specified in the Start/Resume PDU. While in the simulating state, the Simulation Application maintains real-time time-of-day updates.

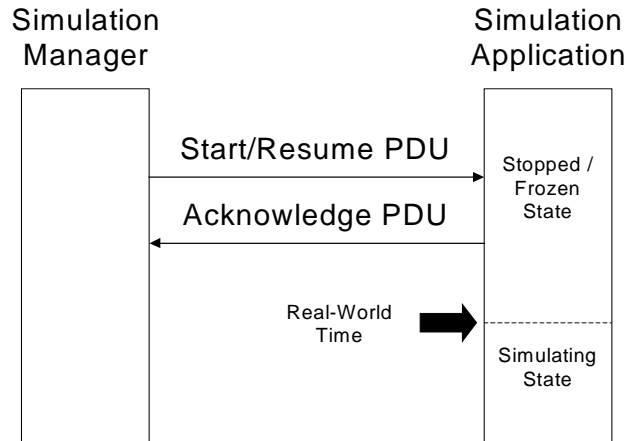


Figure 9 CCTT Start Resume Event Flow Diagram

1.7 STOP FREEZE PDU

The CCTT Simulation Manager sends the Stop/Freeze PDU to the Simulation Application in order to pause the simulation application's simulation operations (See Figure 10). The Stop/Freeze PDU contains one of the following reason codes indicating the simulation manager's intent: recess, reset, restart, reconstitute, or terminate. The Simulation Application acknowledges the Stop/Freeze PDU by sending an Acknowledge PDU to the Simulation Manager within ten seconds of the Stop/Freeze PDU DIS time stamp. The Simulation Application transitions all simulated entities it is responsible for managing to the Stop/Freeze state in accordance with the Frozen Behavior flag at the real-world time specified in the Stop/Freeze PDU. The CCTT Simulation Manager always utilizes the "Continue PDU Receive" Frozen Behavior flag value.

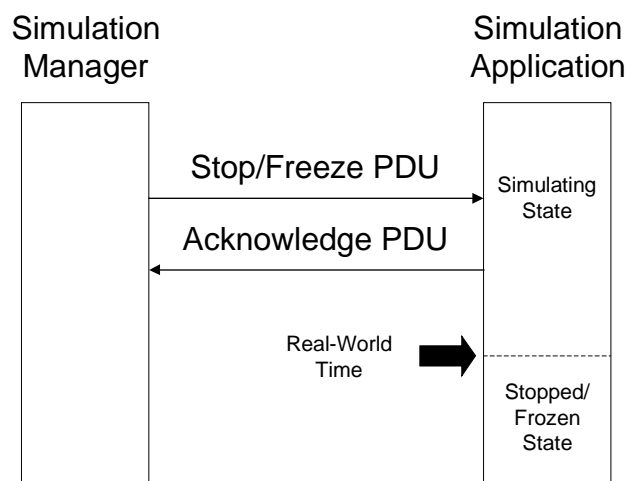


Figure 10 CCTT Stop Freeze Event Flow Diagram

1.8 REMOVE ENTITY PDU

The CCTT Simulation Manager sends the Remove Entity PDU to the Simulation Application in order to terminate simulation of all entities managed by the application (See Figure 11). The Simulation Application acknowledges the Remove Entity PDU by sending an Acknowledge PDU to the Simulation Manager within ten seconds of the Remove Entity PDU DIS time stamp. The simulation application ceases simulating all of its managed entities prior to sending the Acknowledge PDU to the simulation manager.

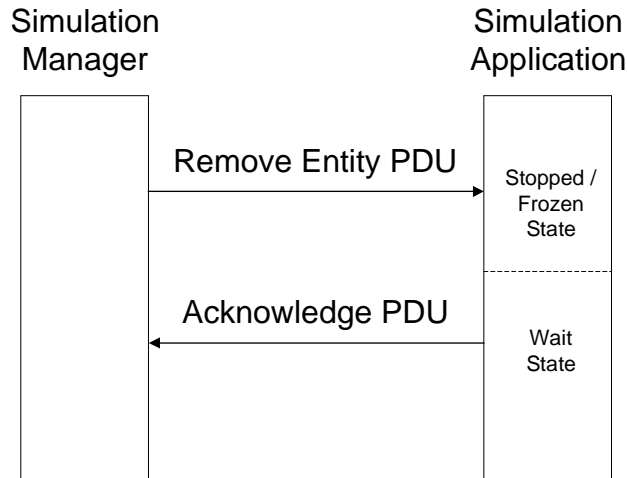


Figure 11 CCTT Remove Entity Event Flow Diagram

2. APPLICATION SEQUENCES

2.1 POWER ON SELF TEST (POST)

In order to establish and maintain a connection to a simulation application, the CCTT simulation manager periodically sends a Data Query Action Request PDU requesting the current state of the Self Test Status record detailing the status of various hardware and software components. The simulation application sends an Action Response PDU with the current state of the Self-Test Status record in response to the Data Query Action Request PDU from the simulation manager. The simulation application performs an assessment to determine the Self-Test Status results for applicable components. The simulation application then reports component passes and failures detected by the application by sending the updated Self-Test Status Action Response PDU upon receipt of the Data Query Action Response PDU.

2.2 DAILY READINESS CHECK

The CCTT simulation manager requests that a simulation application starts performing a daily readiness check by sending the Start Daily Readiness Check Action Request PDU to the application (See Figure 12). The simulation application responds to the Start Daily Readiness Check Action Request PDU by sending a Complete Action Response PDU to the simulation manager after the Daily Readiness Check program has been started. The CCTT simulation manager requests termination of the Daily Readiness Check program by sending the Stop Daily Readiness Check Action Request PDU to the simulation application. The simulation application then responds to the Stop Daily Readiness Check Action Request PDU by sending a Complete Action Response PDU to the simulation manager.

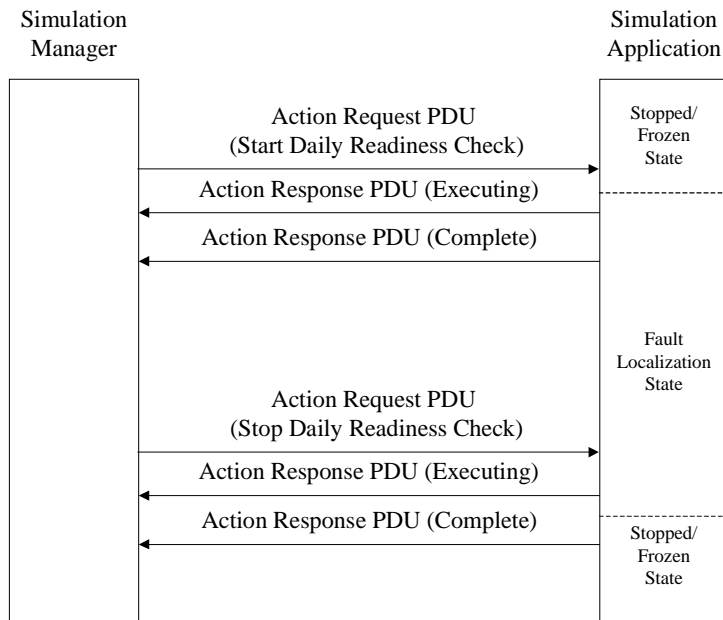


Figure 12 CCTT Daily Readiness Check Event Flow Diagram

2.3 INITIALIZATION

The CCTT Initialization capability establishes the set of initial conditions for a simulation application to operate under during exercise simulation. The CCTT simulation manager sends a local storage of the requested data Action Request PDU in order to establish a simulation application's set of initial conditions. The simulation application responds as Complete to the Action Request PDU when the simulation application is ready to simulate with specified initialization parameters. The application must respond with an executing if the request will take longer than the timeout period.

The following list show what datum is sent to each type of application. It does not imply any particular level of interoperability based on whether an application receives and complies with the data. Interoperability levels based on the datum are defined in specific sections later on in this document.

All simulation applications are sent the following set of datums:

- Dead Reckon Location Threshold Id
- Dead Reckon Orientation Threshold Id
- Dead Reckon Time Threshold Id
- Interoperability Mode Id
- Clouds Status Id
- Clouds Base Altitude Meters Id
- Clouds Ceiling Meters Id
- Clouds Visibility Id
- Fog Status Id

- Fog Ceiling Meters Id
- Fog Visibility Range Meter Fog Status Id
- Haze Status Id
- Haze Ceiling Meters Id
- Haze Visibility Range Meters Id
- Rain Status Id
- Visibility Id
- Rain soak Id
- Humidity Id
- Wind Speed Id
- Checkpoint Interval Data Id
- Lunar Illumination Id
- Simulation Application Role Id
- Radio System Initialization Id
- Radio Sc Net Initialization Id
- Radio Fh Net Initialization Id

Manned Module simulation applications are sent the following additional datum:

- Entity Role Record Id
- Alternative Entity Role Record Id
- Entity Location Mil Grid 10 Id
- Orientation Id
- Entity marking Id
- Vehicle Age Kilometers Id
- Engine Status Id
- Articulated Parameter Record Id
- Force Id
- Guise Mode Id
- Supply Record Id
- Number to Mount Id

Dismounted Infantry Manned Module simulation applications are sent the following additional datum:

- Saf Exercise Filename Id
- Entity Organization Record Id

SAF Workstation simulation applications are sent the following additional datum:

- Saf Exercise Filename Id
- Simulation Application Role Id
- Saf Boss Indicator Id

Computer-Generated Forces simulation applications are sent the following additional datum:

- Saf Exercise Filename Id
- Saf Boss Indicator Id
- Number of Cgf Simulators Id
- Blufor Sim Load Id
- Opfor Sim Load Id

Operations Center Workstation simulation applications are sent the following additional datum:

- Saf Exercise Filename Id
- Saf Boss Indicator Id
- Simulation Application Role Id
- Operations Center Flags Record Id

After-Action Review Workstation simulation applications are sent the following additional datum:

- Exercise Name Id
- Entity Location Mil Grid 10 Id
- Orientation Id
- Simulation Application Active Status Id
- Aar Mode Id
- Aar Voice Channel Id

Synthetic Environment Manager simulations are sent the following additional datum:

- Simulation Application Active Status Id
- Send Object State Data Record Id

The simulation applications may be sent the following datum while they are simulating, (the simulating state from above):

- Dead Reckon Location Threshold Id
- Dead Reckon Orientation Threshold Id
- Dead Reckon Time Threshold Id
- Interoperability Mode Id
- Clouds Status Id
- Clouds Base Altitude Meters Id
- Clouds Ceiling Meters Id
- Clouds Visibility Id
- Fog Status Id
- Fog Ceiling Meters Id
- Fog Visibility Range Meter Fog Status Id
- Haze Status Id
- Haze Ceiling Meters Id
- Haze Visibility Range Meters Id
- Rain Status Id

- Visibility Id
- Rain soak Id
- Humidity Id
- Wind Speed Id
- Checkpoint Interval Data Id
- Lunar Illumination Id
- Simulation Application Role Id

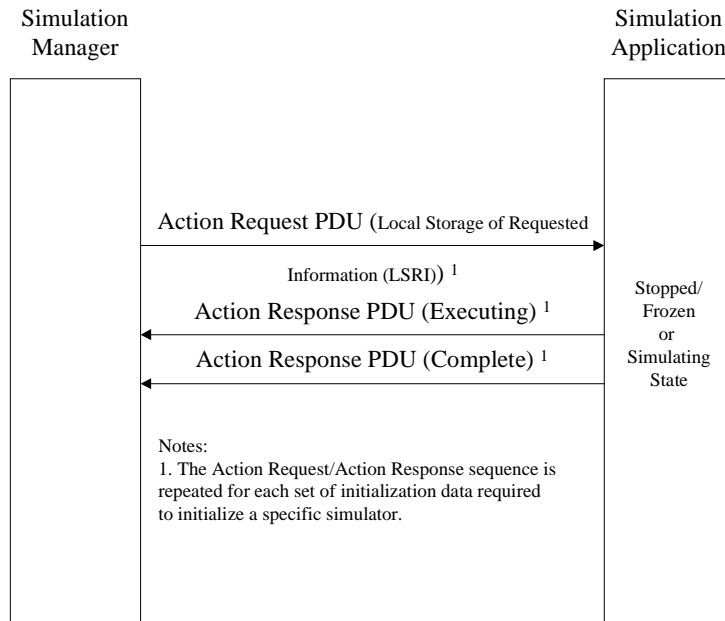


Figure 13 CCTT Initialization Event Flow Diagram

2.4 START / RESUME

The CCTT simulation manager sends a Stop/Freeze PDU to the simulation application requesting that all entities controlled by the simulation application start simulating. The simulation application acknowledges the Start/Resume PDU by sending an Acknowledge PDU to the simulation manager. The simulation application transitions all entities controlled by that simulation application to the simulating state at the real-world time specified in the Start/Resume PDU. The simulation application then maintains simulation time as a continuous virtual-world clock consistent with the simulation time specified in the Start/Resume PDU and commencing at the real-world time specified in the Start/Resume PDU.

2.5 PAUSE

The CCTT simulation manager sends a Recess Stop/Freeze PDU to the simulation application in order to pause all simulated entities controlled by that simulation application. The simulation application acknowledges the Stop/Freeze PDU by sending an Acknowledge PDU to the simulation manager. The

simulation application transitions all simulated entities controlled by that application to the Stop/Freeze state at the real-world time specified in the Stop/Freeze PDU.

2.6 RESTART

The CCTT simulation manager initiates the restart sequence in order to reset all parameters of a simulation application to its initial condition values for the current exercise (See Figure 14). The simulation manager sends the Stop For Restart Stop/Freeze PDU to the simulation application in order to pause the application in preparation for resetting the application back to its initial conditions. The simulation application sends an Acknowledge PDU to the simulation manager in response to the Stop For Restart Stop/Freeze PDU. After the simulation application has been paused, the simulation manager initiates an initialization sequence in order to re-initialize the simulation applications to its initial conditions. The simulation application initializes itself to a state identical to its initialized state immediately following the Create Entity sequence.

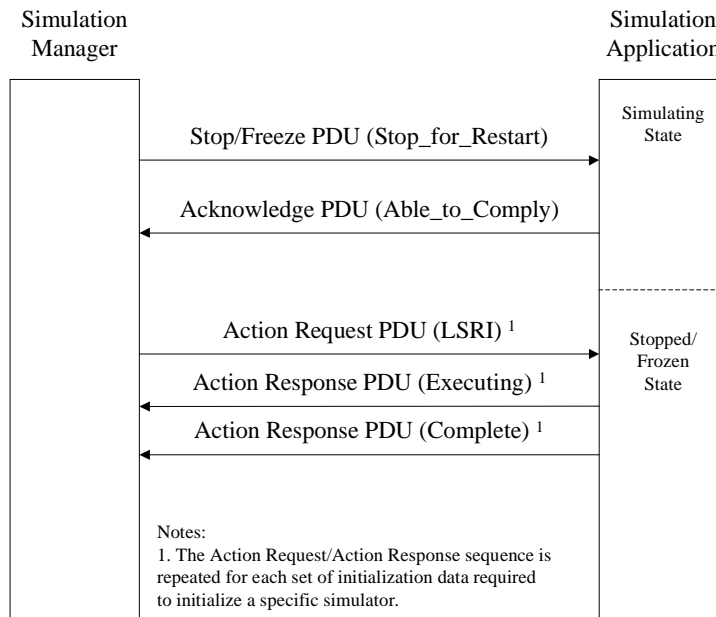


Figure 14 CCTT Restart Event Flow Diagram

2.7 RECONSTITUTE

The CCTT Reconstitute capability returns a destroyed (killed) manned module entity to the exercise (See Figure 15). The CCTT simulation manager sends the Stop/Freeze PDU with a reason code of reconstitution to the simulation application to initiate the Reconstitute sequence and transition the application to the Stopped/Frozen state. The simulation application sends an Acknowledge PDU in response to the PDU. When the simulation application is paused, the simulation manager requests that the simulation application reconstitute the specified manned module entity by sending an Action Request PDU with an action ID of reconstitute. Upon receipt of the Action Request PDU, the simulation

application controlling the manned module entity restores all parameters and states of the manned module to their condition immediately prior to the entity being destroyed.

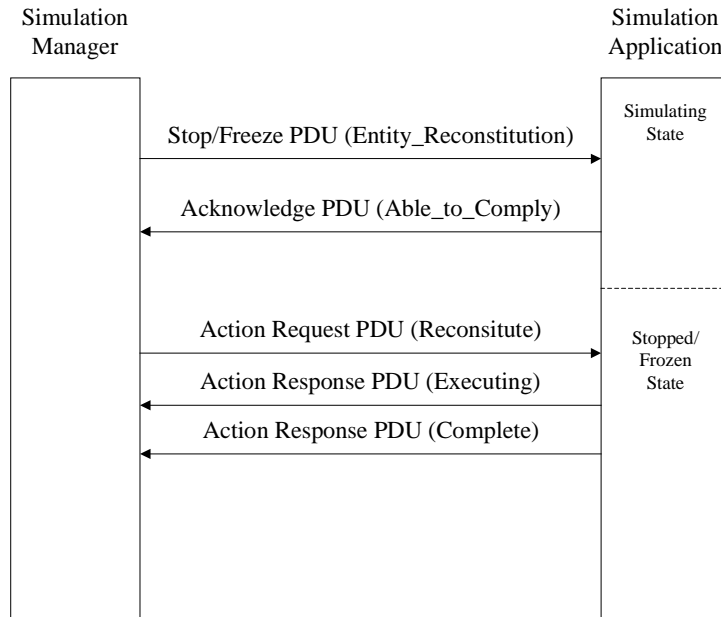


Figure 15 CCTT Reconstitute Event Flow Diagram

2.8 REPOSITION

The CCTT Reposition capability changes the location and orientation of a manned module simulated entity during exercise simulation (See Figure 16). The CCTT simulation manager initiates the Reposition sequence by pausing the manned module via the Stop/Freeze PDU. When the manned module entity is paused, the simulation sends the Local Storage of the Requested Information Action Request PDU with updated position data to the simulation application. The simulation application updates the position and/or orientation of the manned module entity. The following datum is included in the Action Request PDU:

- Entity Location Mil Grid 10 Id
- Entity Orientation Id

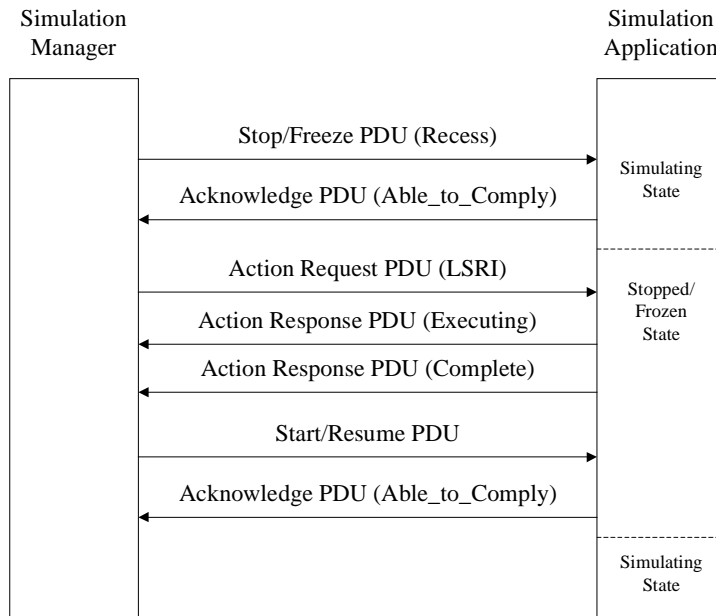


Figure 16 CCTT Reposition Event Flow Diagram

2.9 CHECKPOINT / RESET

The CCTT Reset capability resets the parameters of all simulated entities in an exercise to the logged values nearest to and proceeding the requested reset time. The simulation application performs periodic checkpoints in accordance with the Checkpoint Data Record Id datum as specified in the Local Storage of the Requested Information Action Request PDU from the simulation manager. The Checkpoint Data Record Id datum specifies when to take the next checkpoint (i.e., Start Time), how to identify the checkpoint (checkpoint number), and how often to log subsequent checkpoints (checkpoint interval). All checkpoint times are expressed with respect to simulation time. The simulation application processes updates to the Checkpoint Interval Record Id at a time after it has been created.

The CCTT simulation manager initiates the Reset sequence by sending the Stop/Freeze PDU with a reason code of stop for reset to the simulation application. The simulation acknowledges the Stop/Freeze PDU by sending an Acknowledge PDU to the simulation manager. The simulation manager sends an Action Request with a request ID of recall checkpoint data to the simulation application. The Checkpoint Reset Time Record Id defines the Checkpoint Time and Checkpoint Number of the requested checkpoint. If the simulation application can comply with the Recall Checkpoint Data request, the simulation application sends a Complete Action Response PDU to the simulation manager when the application has restored all entities under its management to the specified checkpoint state. If the simulation application is unable to comply with the Recall Checkpoint Data request, the simulation application sends a Request Rejected Action Response PDU to the simulation manager. The simulation manager initiates a Restart sequence on simulation application that cannot comply to the Recall Checkpoint Data request. A typical reason for not being able to comply with the Recall Checkpoint Data request is that the requested checkpoint occurred prior to the simulation application being created in the current exercise.

2.10 REMOVE

The CCTT simulation manager sends a Stop/Freeze PDU to the simulation application in order to pause all simulated entities controlled by that simulation application (See Figure 17). The simulation application acknowledges the Stop/Freeze PDU by sending an Acknowledge PDU to the simulation manager with Able to Comply status. The simulation manager then sends a Remove Entity PDU to the simulation application. The simulation application acknowledges the PDU request by sending an Acknowledge PDU with Able to comply status.

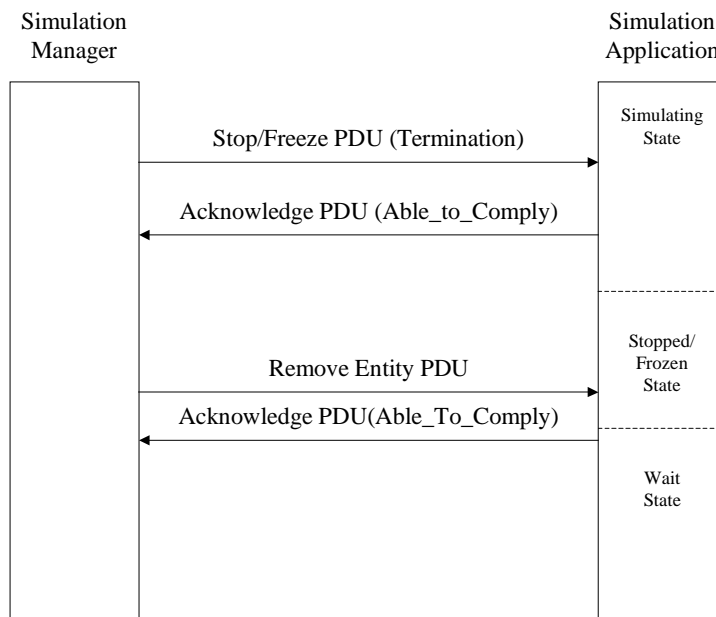


Figure 17 CCTT Remove Entity Event Flow Diagram

Capability Area: Simulation Manager

Chap	ICD Paragraph Title	Capability Detail	Testable Attribute	Attribute Test Sequence	Entry Level Test / Drop Back Level					Test Approach			Manual Test Method Available	Test Notes
					1	2	3	4	5	DIS Tool Test	Output/Visual Inspection during exercise	Code and/or Data File Inspection		
3	TIME SYNCHRONIZATION	Maintain time synchronization with CCTT	infr_time_sync	1.1	0	N/A	N/A	N/A	N/A	Y				
4	START RESUME PDU	Maintain correlation time with CCTT	siman_sim_time	1.2	0	N/A	N/A	N/A	N/A	Y				
3	DATA PACKAGING AND TRAFFIC SEGMENTATION	Support communication with the CCTT simulation manager via the Broadcast channel	infr_broadcast	3.1	N/A	N/A	2	N/A	N/A	Y				
	DATA PACKAGING AND TRAFFIC SEGMENTATION	Supports communication with CCTT applications using the Multicast channel	infr_multicast	3.2	N/A	N/A	2	N/A	N/A	Y				
4	ACTION REQUEST / ACTION RESPONSE PROTOCOL	Maintain communication with Simulation Manager.	siman_action_response_time	3.3	N/A	N/A	2	N/A	N/A	Y				
	ACTION REQUEST / ACTION RESPONSE PROTOCOL	Support SIMAN error protocols	siman_action_request_rejected	5.1	N/A	N/A	N/A	N/A	4	Y				
		Supports SIMAN status request protocol	siman_action_request_pending	5.2	N/A	N/A	N/A	N/A	4	Y				
			siman_action_request_executing	5.3	N/A	N/A	N/A	N/A	4	Y				
			siman_action_request_completed	5.4	N/A	N/A	N/A	N/A	4	Y				
			siman_action_request_status	5.5	N/A	N/A	N/A	N/A	4	Y				
		Maintain communication with Simulation Manager.	siman_create_entity_time	3.4	N/A	N/A	2	N/A	N/A	Y				
	POWER ON SELF TEST (POST)	Supports POST protocol and run-time health status checking	siman_post_status	4.1	N/A	N/A	N/A	3	N/A	Y	Y			
	ENTITY CREATION / IDENTIFICATION	Support Entity Creation	siman_create_entity	4.2	N/A	N/A	N/A	3	N/A	Y				
	CREATE ENTITY PDU		siman_create_entity_protocol	3.5	N/A	N/A	2	N/A	N/A	Y				
	ENTITY CREATION / IDENTIFICATION		siman_create_entity_protocol	3.6	N/A	N/A	2	N/A	N/A	Y				
	CREATE ENTITY PDU		siman_create_after_remove	4.3	N/A	N/A	N/A	3	N/A	Y				
			siman_create_rejected	3.7	N/A	N/A	2	N/A	N/A	Y				
	INITIALIZATION	Support Entity Initialization	siman_initialize	5.6	N/A	N/A	N/A	N/A	4	Y				
			siman_initialize_protocol	5.7	N/A	N/A	N/A	N/A	4	Y				
	DATA QUERY	Support Data Query Requests	siman_data_query	5.8	N/A	N/A	N/A	N/A	4	Y				
	START/RESUME PDU	Support Start/Resume Capability	siman_start_resume_protocol	2.1	N/A	1	N/A	N/A	N/A	Y				

Capability Area: Simulation Manager

Chap	ICD Paragraph Title	Capability Detail	Testable Attribute	Attribute Test Sequence	Entry Level Test / Drop Back Level					Test Approach			Manual Test Method Available	Test Notes
					1	2	3	4	5	DIS Tool Test	Output/Visual Inspection during exercise	Code and/or Data File Inspection		
4	START / RESUME	Support Start/Resume Capability	siman_start_resume	2.2	N/A	1	N/A	N/A	N/A	Y				
	START RESUME PDU		siman_start_rejected	2.3	N/A	1	N/A	N/A	N/A	Y				
	PAUSE	Support Pause Capability	siman_pause	2.4	N/A	1	N/A	N/A	N/A	Y				
			siman_pause_protocol	2.5	N/A	1	N/A	N/A	N/A	Y				
			siman_pause_rejected	2.6	N/A	1	N/A	N/A	N/A	Y				
	RESTART	Restart Capability	siman_restart	2.7	N/A	1	N/A	N/A	N/A	Y				
			siman_restart_protocol	2.8	N/A	1	N/A	N/A	N/A	Y				
			siman_restart_rejected	2.9	N/A	1	N/A	N/A	N/A	Y				
	RECONSTITUTE	Reconstitute	siman_reconstitute	2.10	N/A	1	N/A	N/A	N/A	Y				
			siman_reconstitute_protocol	2.11	N/A	1	N/A	N/A	N/A	Y				
			siman_reconstitute_rejected	2.12	N/A	1	N/A	N/A	N/A	Y				
	RESET / CHECKPOINT	Reset	siman_reset	2.13	N/A	1	N/A	N/A	N/A	Y				
			siman_reset_protocol	2.14	N/A	1	N/A	N/A	N/A	Y				
			siman_reset_rejected	2.15	N/A	1	N/A	N/A	N/A	Y				
		Checkpoint	siman_checkpoint_interval	2.16	N/A	1	N/A	N/A	N/A	Y	Y			
			siman_checkpoint_interval	2.17	N/A	1	N/A	N/A	N/A	Y	Y			
	REMOVE	Remove	siman_remove	2.18	N/A	1	N/A	N/A	N/A	Y				
			siman_remove_protocol	2.19	N/A	1	N/A	N/A	N/A	Y				
			siman_remove_rejected	2.20	N/A	1	N/A	N/A	N/A	Y				
	REPOSITION	Reposition	siman_reposition	2.21	N/A	1	N/A	N/A	N/A	Y				

CHAPTER FIVE – COMMUNICATIONS

The CCTT communications system supports both voice (radio, landline, intercom) and digital message communications. Digital message communications for CCTT consist of the Digital Messaging Device (DMD) and the Army Field Artillery Tactical Data System (AFATDS). The communications system simulation capabilities provide realistic and accurate communication functions among modules and workstations throughout the CCTT system.

The voice communication components consist of trainer-unique devices replicating SINCGARS radios, Remote Control Units (RCUs), land line Telephones, vehicle intercom control boxes, and the associated voice processing software and hardware. At OC Consoles, the digital communications components consist of a trainer-unique device replicating a DMD and the associated software to simulate AFATDS Fire Support Control Terminal (FSCT) controls and displays.

The CCTT communications system uses the FDDI LAN to transport both voice and digital message data. For voice communications, analog voice data is digitized, packeted into DIS PDU formats, and sent over the FDDI network. Receiving nodes unpack the digitized voice data, process them to simulate environmental and other communication effects and then convert them to analog form suitable for play on a loudspeaker. For digital message communications (DMD AFATDS) simulation, software driven by user inputs converts digital message data to PDU formats, which are transmitted via the FDDI Network for display at OC consoles.

The Communications System integrates voice and data over a single CCTT FDDI network utilizing prioritization and group address filtering of voice packets on the FDDI network adapter interface to insure latency and throughput requirements for up to 60 radio communications channels. The communications system integrates the digital data messages by the use of the Signal PDU as a common transport format which can efficiently be used by both voice and data simultaneously. A type indicator in the header of the signal PDU allows for the receiving nodes to distinguish voice versus data. This represents a very efficient method of network utilization.

The delivery of packetized digitized voice and digital message data is achieved via a group addressing architecture that enables the communications system to support 255 exercises and 255 communications channels. The current default is the required 5 exercises and 60 separate frequencies per exercise.

1. COMMUNICATIONS SERVICES

The set of services which allows all CCTT simulation applications to exchange digitized voice data form the simulated voice communications system, its components are: SINCGARS, Instructional Voice Channel (IVC), Vehicle Intercom System, and Digital Message Data Device emulation.

As shown in the figure below, the SINCGARS radio communications consist of a SINCGARS Radio hardware emulation coupled with a SINCGARS Radio simulation that uses the CCTT FDDI Network to send and receive voice data to and from other radios during an exercise. The SINCGARS radio simulation uses the IO System to input digitized voice data which is then encapsulated in a DIS PDU and sent over the network, while DIS PDU(s) of the SINCGARS type received from the network are decoded and sent to the IO system for playback.

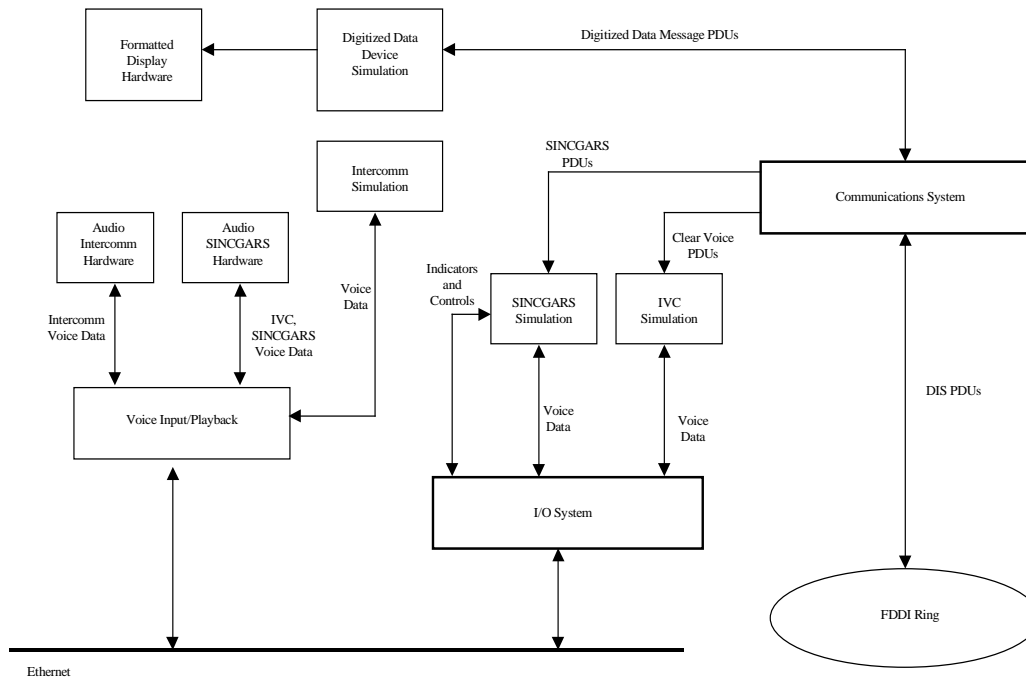


Figure 18 SINCGARS Communication Flow Diagram

2. VOICE COMMUNICATIONS

The voice communications are implemented using the Digital Audio Intercom System (DAIS) which is part of the Process Interface Electronics (PIE) I/O subsystem for direct input of voice and playback, and the FDDI LAN for voice data transport. The DAIS provides greater than 60dB signal to noise ratio and greater than 60dB inter-channel cross talk rejection; the operational requirement is 50 dB. The DAIS offers noise simulation functions providing programmable signal degradation capabilities.

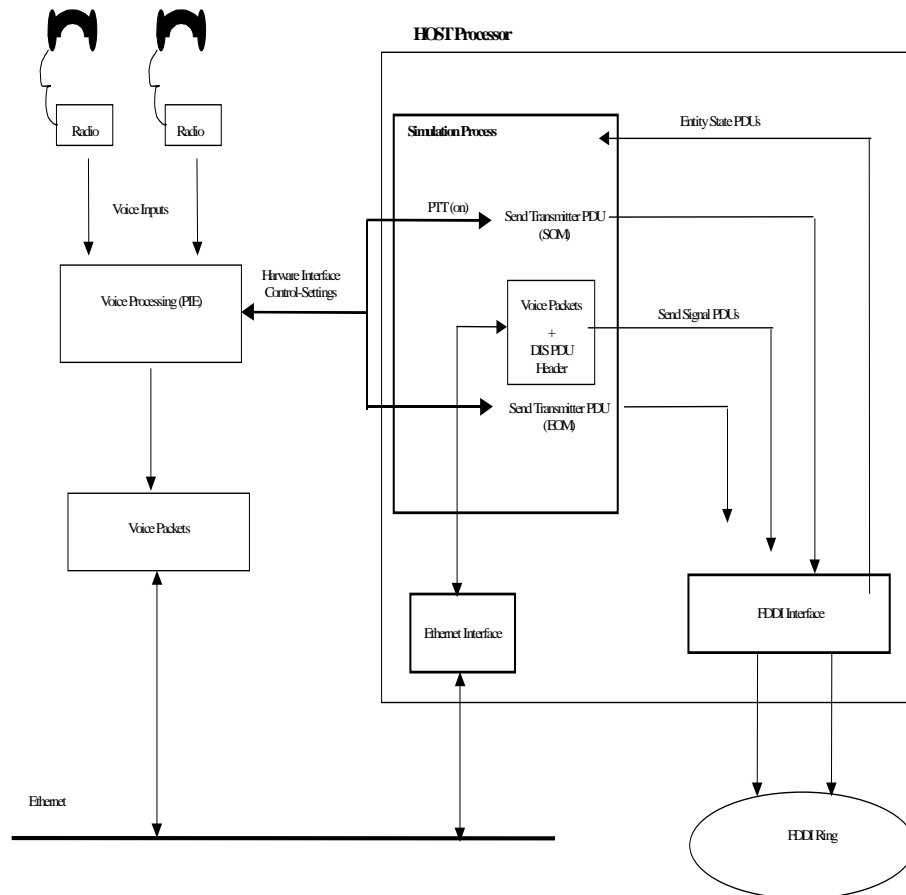


Figure 19 Voice Communication Flow Diagram

Two PDUS types, the Transmitter PDU and the Signal PDU, are used to communicate the state and the voice information for the digital communications. The analog voice input is digitized at the PIE, and the resulting digital voice data is sent to the CCTT Network by the local processor as multiple voice samples in a voice packet appended to a DIS PDU header. The sending of digitized voice data over the CCTT Network is done in a prioritized fashion using a priority a DIS Multicast Service. The synchronous FDDI Link Layer guarantees reliable delivery of the digitized voice data and provides for the digital communications to be serviced with the highest priority.

The communications method provides for a start of transmission indication sent to the CCTT Network by the use of a Transmitter PDU containing the active state of the transmitter. One or more Signal PDUs are subsequently sent containing the digitized voice data; the transmission is terminated via a Transmitter PDU indicating the transmitter state as no longer active. The Transmitter PDU contains radio parameters such as identification, antenna direction, signal location, frequency or channel, and power. These are used by the receiving entity to perform calculations reflecting the signal degradation and noise corruption effects on all signal PDUs that subsequently arrive, thus achieving a more realistic radio frequency communications as would occur on the battlefield environment.

The Transmitter PDU is also used to convey frequency information that permits relating of the frequency with a unique group address that allows the filtering at the receiving stations of Signal PDUs based on the Channel ID. This Group address filtering of digital communications over the network lowers the processing cost by reducing interrupt processing at the receiving hosts, thus enhancing network performance, and allow for CPU allocation quotas to be met.

3. SINGARS RADIO COMMUNICATIONS

CCTT simulates the RT-1523A version of the SINGARS receiver-transmitter. The SINGARS components include the CECOM SINGARS radio model and its corresponding faceplate. Switch control inputs, numeric keypad entries and functional keypad entries are read. The switches allow the user to change the mode, channel, power level, function, and communications security parameters (COMSEC). The functional keypad entries allow the operator to change the Frequency, Data Rate, communications security Key, Single Channel Frequency Offset, Time and Battery level. The radio transmission and reception behaviors, including signal propagation, are simulated as adapted from the CECOM SINGARS Radio Model (SRM) for use in CCTT. The simulated SINGARS operates at 30Hz, rather than 15Hz, so that it can transfer digitized audio data between the I/O system and the FDDI LAN on a more frequent basis, preventing audio dropouts.

The SINGARS radio is a single channel radio in that it can transmit and receive on only one channel at a time. Single Channel or the SC mode of operation indicates that only one frequency is being used for communications. The SINGARS radio operates on 2320 different frequencies in the range of 30.0 KHz to 87.975 MHz, with a 25 KHz separation between frequencies. Eight SC frequencies can be loaded into a SINGARS RT. A built in Communications Security (COMSEC) feature is used to prevent the enemy from intercepting friendly traffic. In frequency hopping mode of operation, the SINGARS radio transmits on any or all of the 2320 frequencies available, with 25KHz separation. In the 30KHz to 87.975 MHz range, typically 1200 or more of the total 2320 frequencies are normally used. In the frequency hop (FH) mode of operation, a SINGARS radio uses, or “hops on”, more than one frequency per second. For two or more radios operating in FH mode to communicate, they must contain the same set of frequencies and other parameters normally denoted as “FH Data”. The frequencies made available to a SINGARS radio to communicate is denoted “the Hopset”. The definition of a Hopset includes what remains of the total 2320 available frequencies minus those protected frequencies (denoted as Lockouts, for their use would interfere with other communications).

4. INSTRUCTOR VOICE CHANNEL COMMUNICATIONS

The purpose of the IVC is to provide a voice communications mechanism between the exercise facilitators at the MCC or AAR and the exercise participants in the manned modules. The commander at the AAR can instruct trainees during the exercise using a clear voice or IVC channel. The IVC channel provides a focused conversation for instructional purposes without other interfering voice

communications, thus allowing these parties to discuss exercise support issues, without using the exercises simulated radios, to avoid interfering with other exercises participants who are using the exercises communications channels for tactical communications. Communication via the IVC capability is also independent of the state of the simulated radios such as electrical power, combat damage, etc., and environmental impediments to communications such as signal propagation, terrain, etc.

5. INTERCOM COMMUNICATIONS

The purpose of the intercom is to simulate the controls, indicators and functions of the vehicular intercom system, AN/VIC-1. The intercom system allows vehicle crewmembers to talk and listen to each other, as well as parties external to the vehicle, through radios connected to the intercom system.

6. DIGITIZED DATA COMMUNICATIONS

The CCTT communications system supports realistic TACFIRE version 10 digital communications for fire support control. The Dismounted Infantry (DI) and FIST-V simulators are equipped with a DMD. The CCTT FSE and FABTOC software support a limited set of the TACFIRE message types to allow the necessary dialog with the FIST-V and DI forward observers. The communication system transports the TACFIRE Digital Data Messages via the FDDI Network using Transmitter PDU(s) and Signal PDU(s). The Transmitter PDU initiates the data transmission and the Signal PDU contains the digital message data. The system uses the Radio ID field to distinguish between a SINCGARS radio and digital data transmission. For TACFIRE 10 protocol digital messages, the Signal PDU Encoding Scheme Class must be set to raw binary data. The signal PDU data field contains the actual ASCII TACFIRE fixed 44 byte-encoded message. For TACFIRE acknowledge (ACK) and not acknowledge (NAK) messages, only the TACFIRE header and ACK/NAK indicators are sent.

The IVIS digital protocol is communicated to the radio capability where it is packed into DIS Signal PDUs. The radio capability also extracts the digital protocol from received PDUs for consumption by the IVIS applications. IVIS provides a limited capability to interface with existing artillery devices (FIST FED) for the purpose of requesting indirect fire support.

Capability Area: Communications

Chap	ICD Paragraph Title	Capability Detail	Testable Attribute	Attribute Test Sequence	Entry Level Test / Drop Back Level					Test Approach			Manual Test Method Available	Test Notes
					1	2	3	4	5	DIS Tool Test	Output/Visual Inspection during exercise	Code and/or Data File Inspection		
5	SINCGARS Radio Communications	Support the Single Channel Mode of radio Communications on CCTT compatible frequency range.	sicgars_radio_single_channel	5.1	N/A	N/A	N/A	N/A	4					
		Support the frequency Hop mode of radio communications by using a time variant frequency allocation on the same allowable frequency set and lockout set as the SINCGARS radio	sicgars_radio_frequency_hop	5.2	N/A	N/A	N/A	N/A	4					
		Support secure radio communications by using a Traffic Encryption Key (TEK) of the same size and value as specified for SINCGARS radio communications.	sicgars_radio_sc_comsec	5.3	N/A	N/A	N/A	N/A	4					
	Digitized Data Communications	Support TACFIRE digital message communication for fire support control.	comm_digital_TACFIRE	3.1	N/A	N/A	2	N/A	N/A	Y				
		Support IVIS digital protocol communication	comm_digital_ivis	3.2	N/A	N/A	2	N/A	N/A	Y				

CHAPTER SIX – SYNTHETIC ENVIRONMENT

1. ENTITY CHARACTERISTICS

In an exercise, each simulator / simulation is responsible for providing the physical characteristics and performance capabilities of each entity. Interoperability requires consistency across entity representations, i.e., the physical characteristics and capabilities of a particular entity must be the same for each application affected. In CCTT, entities can be categorized as either vehicle platforms or human life forms.

The physical characteristics of a vehicle platform include its hull type, physical size and weight, articulations, weapons' capabilities, sensor devices, and its resources (fuel, ammo levels, etc.). Performance characteristics include resource consumption mobility based on environment and damage effects from munitions. For human life forms, physical characteristics include physical dimensions in various positions and weight. Performance characteristics include mobility and energy expenditure / recovery profiles.

This table provides the physical characteristics of the entities that are generated and understood by the CCTT system. The model type and mobility class are used to determine the speeds that are attainable by the entities based on terrain type.

Platform	Hull Model Type (m)	Hull Mobility Class (m)	Mass (Kg)	Height (m)	Bumper Height (m)	Hull Height (m)	Width (m)	Length (m)
A10A	FWA	A10_TYPE	18007.312	4.47	0.0	3.25	17.54	17.39
AH1S	RWA	AH1S_TYPE	4535.96	3.7338	0.0	3.47	3.19	13.75
AH64	RWA	AH64A_TYPE	9525.51	3.6068	0.0	4.18	5.23	14.97
AMX10	WHEELED	HIGH	3719.496	2.95	0.0	2.03	2.90	5.78
AMX10RC	WHEELED	HIGH	3719.496	2.95	0.0	1.73	3.02	6.29
AMX30	TRACKED	LOW	55202.758	2.85	0.0	1.69	3.10	6.60
AMX40	TRACKED	HIGH	57153.225	3.08	0.0	1.58	3.28	6.92
BAT2	TRACKED	GOOD	29022.045	3.32	0.0	3.32	5.10	7.36
BMP1KSHM	TRACKED	GOOD	29022.045	2.885	0.0	1.60	3.46	6.80
BMP1P	TRACKED	GOOD	29022.045	2.885	0.0	1.60	3.46	6.81
BMP2	TRACKED	HIGH	57153.225	2.885	0.0	1.60	3.40	6.80
BMP3	TRACKED	HIGH	57153.225	2.885	0.0	2.00	3.40	7.40
BRDM2	WHEELED	LOW	28123.016	2.15	0.0	2.03	2.39	5.70
BRDM2_AT5_ATGM	WHEELED	LOW	28123.016	2.15	0.0	2.03	2.40	5.70

Platform	Hull Model Type (m)	Hull Mobility Class (m)	Mass (Kg)	Height (m)	Bumper Height (m)	Hull Height (m)	Width (m)	Length (m)
BREM1	TRACKED	HIGH	12201.760	3.15	0.0	2.50	3.12	7.27
BTR60P	WHEELED	HIGH	3719.496	2.31	0.0	1.81	2.80	6.98
BTR80	WHEELED	HIGH	3719.496	2.80	0.0	1.81	2.80	7.48
CHALLENGER	TRACKED	LOW	55202.758	2.885	0.0	1.77	3.52	9.25
CHIEFTAIN	TRACKED	LOW	55202.758	2.895	0.0	2.00	3.65	7.52
CIS_2S12	STATIONARY	STANDARD	3210.0	2.885	0.0	1.48	3.64	6.88
D30	STATIONARY	STANDARD	3210.0	1.30	0.0	1.30	2.30	5.00
F16	FWA	F16_TYPE	14515.312	4.907	0.0	4.19	9.75	14.70
GAZ66	WHEELED	LOW	28123.016	2.885	0.0	2.52	2.33	2.52
GMZ_TML	TRACKED	MODERATE	12201.760	2.885	0.0	2.70	3.12	8.30
KA50A	RWA	AH64A_TYPE	9525.51	3.7338	0.0	3.45	5.82	16.35
KMT5M	TRACKED	LOW	55202.758	3.83	0.0	1.44	4.20	3.60
KRAZ255B	WHEELED	LOW	28123.016	3.15	0.0	3.15	2.76	8.64
KRAZ255B_FUEL	WHEELED	LOW	28123.016	3.175	0.0	2.98	3.70	8.64
LEO1A4	TRACKED	HIGH	57153.225	2.4	0.0	1.84	3.25	7.10
LEO2	TRACKED	HIGH	57153.225	2.885	0.0	1.68	3.70	7.30
M1_ABRAMS	TRACKED	HIGH	57153.225	2.40	1.20	1.74	3.70	7.90
M1025	WHEELED	HIGH	3719.496	1.90	0.60	1.90	2.20	4.60
M1043	WHEELED	HIGH	3719.496	1.90	0.60	1.90	2.20	4.60
M1044	WHEELED	HIGH	3719.496	1.90	0.60	1.90	2.20	4.60
M1064	TRACKED	HIGH	12201.760	3.83	0.0	1.86	2.54	5.25
M1078	WHEELED	HIGH	3719.496	2.885	0.0	2.85	2.09	6.43
M1079	WHEELED	HIGH	3719.496	3.48	0.0	3.48	2.44	6.43
M1083	WHEELED	HIGH	3719.496	2.885	0.0	2.85	2.09	7.58
M1083_VOLCANO	WHEELED	HIGH	3719.496	2.885	0.0	2.85	2.44	7.58
M1089_WINCH	WHEELED	HIGH	3719.496	2.885	0.0	2.85	2.09	8.78
M1091_WINCH	WHEELED	HIGH	3719.496	2.885	0.0	2.85	2.44	7.98
M109A5	TRACKED	HIGH	29022.045	3.62	0.0	1.54	3.00	5.77
M109A6	TRACKED	HIGH	29022.045	3.62	0.0	1.54	3.00	5.77
M113	TRACKED	HIGH	12201.760	2.30	0.70	2.30	2.70	5.30

Platform	Hull Model Type (m)	Hull Mobility Class (m)	Mass (Kg)	Height (m)	Bumper Height (m)	Hull Height (m)	Width (m)	Length (m)
M113A3	TRACKED	HIGH	12201.760	2.30	0.70	2.30	2.70	5.30
M1A1_ABRAMS	TRACKED	HIGH	57153.225	2.40	1.20	1.74	3.70	7.90
M1A1_MINE_PLOWS	TRACKED	HIGH	57153.225	2.40	1.20	1.74	3.70	7.90
M1A1_MINE_ROLLERS	TRACKED	HIGH	57153.225	2.40	1.20	1.74	3.70	7.90
M1A2	TRACKED	HIGH	57153.225	2.40	1.20	1.74	3.70	7.90
M270	TRACKED	HIGH	29022.045	2.65	0.0	2.65	2.43	7.00
M2A2	TRACKED	GOOD	29022.045	2.80	0.90	2.05	3.20	6.20
M3A2	TRACKED	GOOD	29022.045	2.80	0.90	2.05	3.20	6.20
M577A2	TRACKED	HIGH	12201.760	2.686	0.0	2.43	2.54	4.92
M58A3_WITH_ROCKET	TRACKED	HIGH	220.0	2.885	0.0	1.83	1.93	4.05
M58A3_WITHOUT_ROCKET	TRACKED	HIGH	220.0	2.885	0.0	1.83	1.93	4.05
M60_BRIDGE	TRACKED	LOW	55202.758	2.885	0.0	1.83	3.68	6.75
M60_CHASSIS_WITHOUT_BRIDGE	TRACKED	LOW	55202.758	3.90	0.0	1.83	3.68	6.75
M60A1	TRACKED	LOW	55202.758	3.83	0.0	1.83	3.68	6.75
M728	TRACKED	HIGH	55202.758	3.26	0.0	2.03	3.68	7.60
M88A2	TRACKED	HIGH	55202.758	3.124	0.0	2.59	3.43	7.37
M9	TRACKED	HIGH	55202.758	2.53	0.0	2.24	2.79	6.05
M93	WHEELED	HIGH	3719.496	2.885	0.0	2.35	3.05	7.30
M966	WHEELED	HIGH	3719.496	1.90	0.60	1.90	2.20	4.60
M977	WHEELED	LOW	28123.016	2.885	0.0	2.82	2.44	9.96
M977_MINE_PLOWS	WHEELED	LOW	28123.016	2.885	0.0	2.82	2.44	9.96
M977_MINE_ROLLERS	WHEELED	LOW	28123.016	2.885	0.0	2.82	2.44	9.96
M978	WHEELED	LOW	28123.016	2.885	0.0	2.82	2.44	9.94

Platform	Hull Model Type (m)	Hull Mobility Class (m)	Mass (Kg)	Height (m)	Bumper Height (m)	Hull Height (m)	Width (m)	Length (m)
M981	TRACKED	HIGH	12201.760	2.70	0.70	1.90	2.70	5.30
M984E1	WHEELED	LOW	28123.016	2.84	0.0	2.82	2.44	9.58
M985	WHEELED	LOW	28123.016	2.84	0.0	2.82	2.44	9.62
M985_MINE_PLOWS	WHEELED	LOW	28123.016	2.84	0.0	2.82	2.44	9.62
M985_MINE_ROLLERS	WHEELED	LOW	28123.016	2.84	0.0	2.82	2.44	9.62
M992	TRACKED	HIGH	29022.045	3.2385	0.0	2.64	3.05	6.24
M998	WHEELED	HIGH	3719.496	2.885	0.60	2.33	2.20	4.60
MARDER2	TRACKED	HIGH	57153.225	3.24	0.0	1.95	3.20	5.62
MI24P	RWA	AH64A_TYPE	9525.51	4.36	0.0	4.36	8.41	17.00
MI28	RWA	AH64A_TYPE	9525.51	3.72	0.0	3.72	4.85	16.78
MI8TBK	RWA	UH60A_TYPE	9979.037	4.40	0.0	4.40	4.50	18.11
MIG27	FWA	F16_TYPE	14515.312	5.09	0.0	4.22	4.57	16.69
MT12	STATIONARY	STANDARD	3210.0	2.885	0.0	1.43	1.70	4.80
MTLB_1V12	TRACKED	HIGH	57153.225	3.24	0.0	1.43	1.70	4.80
MTU20	TRACKED	LOW	55202.758	3.40	0.0	1.72	3.30	6.60
MTU20_BRIDGE	TRACKED	LOW	55202.758	3.40	0.0	1.72	3.30	6.60
MTU20_CHASSIS_WITHOUT_BRIDGE	TRACKED	LOW	55202.758	3.40	0.0	1.72	3.30	6.60
OH58D	RWA	OH58D_TYP E	2041.166	3.98	0.0	3.98	2.09	10.22
SA13SAM	TRACKED	GOOD	29022.045	2.24	0.0	1.60	3.00	6.39
SA15SAM	TRACKED	GOOD	29022.045	2.885	0.0	2.25	3.20	7.90
SPA_2S1	TRACKED	GOOD	29022.045	2.885	0.0	2.23	3.25	7.91
SPA_2S19	TRACKED	MODERATE	12201.760	2.985	0.0	1.46	3.53	7.25
SPA_2S23	TRACKED	GOOD	29022.045	3.075	0.0	1.81	2.80	7.43
SPA_2S3	TRACKED	MODERATE	12201.760	3.130	0.0	1.56	2.67	7.00
SPA_2S31	TRACKED	GOOD	29022.045	2.885	0.0	1.60	3.08	7.05
SPA_2S6	TRACKED	MODERATE	12201.760	1.88	0.0	1.81	3.05	7.93

Platform	Hull Model Type (m)	Hull Mobility Class (m)	Mass (Kg)	Height (m)	Bumper Height (m)	Hull Height (m)	Width (m)	Length (m)
SU17	FWA	F16_TYPE	14515.312	5.09	0.0	3.95	13.55	19.01
SU24	FWA	F16_TYPE	14515.312	6.1722	0.0	5.22	15.10	21.26
SU25	FWA	A10_TYPE	18007.312	4.80	0.0	4.00	15.95	14.48
T62	TRACKED	LOW	55202.758	2.40	0.0	1.52	3.28	6.60
T62_WITH_MINE_PLOW_ROLLER	TRACKED	LOW	55202.758	2.40	0.0	1.52	3.28	6.60
T64BV	TRACKED	LOW	55202.758	3.30	0.0	1.51	3.30	6.13
T64BV_WITH_MINE_PLOW_ROLLER	TRACKED	LOW	55202.758	2.30	0.0	1.51	3.30	6.13
T72	TRACKED	HIGH	57153.225	2.885	0.0	1.48	3.64	6.88
T72_WITH_MINE_PLOW_ROLLER	TRACKED	HIGH	57153.225	2.30	0.0	1.48	3.64	6.88
T72BV	TRACKED	HIGH	57153.225	2.30	0.0	1.48	3.64	6.88
T72BV_WITH_MINE_PLOW_ROLLER	TRACKED	HIGH	57153.225	2.30	0.0	1.48	3.64	6.88
T80	TRACKED	HIGH	57153.225	2.30	0.0	1.40	3.53	7.02
T80_WITH_MINE_PLOW_ROLLER	TRACKED	HIGH	57153.225	2.30	0.0	1.40	3.53	7.02
T80UV	TRACKED	HIGH	57153.225	2.30	0.0	1.40	3.53	7.02
T80UV_WITH_MINE_PLOW_ROLLER	TRACKED	HIGH	57153.225	2.30	0.0	1.40	3.53	7.02
UAZ469B	WHEELED	HIGH	3719.496	2.885	0.0	2.01	1.78	4.27
UH60A	RWA	UH60A_TYPE	9979.037	3.63	0.0	3.63	4.80	15.11
WARRIOR	TRACKED	HIGH	57153.225	2.885	0.0	1.95	3.03	6.35
ZSU23_4	TRACKED	MODERATE	12201.760	2.885	0.0	1.52	3.04	6.59

This table provides the maximum speed of each vehicle type as a function of soil type. For each terrain type, the maximum speed attainable by platform entities based on the designation provided in the physical characteristics table.

Terrain Type	Tracked High	Tracked Good	Tracked Moderate	Tracked Low	Wheeled High	Wheeled Low
Terrain_1	8.707	5.536	4.925	4.738	5.364	6.691
Terrain_2	8.753	5.552	4.946	4.752	5.364	17.336
Terrain_3	8.753	5.552	4.946	4.752	5.364	17.881
Terrain_4	0.000	3.570	4.396	2.213	11.456	4.985
Terrain_5	6.005	5.146	4.900	3.999	13.581	2.972
Terrain_6	9.347	6.394	7.712	5.185	17.881	6.566
Terrain_7	12.719	11.084	9.304	6.772	17.881	9.501
Terrain_8	15.364	13.372	9.815	8.342	17.881	12.163
Terrain_9	17.161	15.437	10.317	9.573	17.881	12.975
Terrain_10	13.509	11.263	9.413	6.972	17.881	11.150
Terrain_11	15.343	13.017	9.788	8.212	17.881	12.402
Terrain_12	16.826	15.291	10.264	9.414	17.881	14.998
Terrain_13	18.057	16.135	13.676	10.657	17.881	17.881
Terrain_14	15.467	13.459	9.879	8.398	17.881	12.362
Terrain_15	17.248	15.515	10.370	9.624	17.881	17.881
Terrain_16	9.347	6.394	7.712	5.185	11.681	6.895
Terrain_17	18.596	16.540	15.773	13.234	26.822	17.881
Terrain_18	18.596	16.540	15.773	13.234	26.822	17.881
Terrain_19	0.000	0.000	0.000	0.000	0.000	0.00
Terrain_20	18.596	16.540	17.227	13.411	26.822	17.881
Terrain_21	18.596	16.540	17.227	13.411	26.822	17.881
Terrain_22	11.042	6.378	4.977	5.952	12.189	7.756
Terrain_23	15.084	10.985	7.566	7.880	13.355	11.620
Terrain_24	10.225	6.025	4.925	5.307	11.034	7.378
Terrain_25	13.178	7.857	6.398	6.745	12.526	10.258
Terrain_26	6.544	3.023	3.314	2.341	2.291	2.095
Terrain_27	0.000	0.000	0.00	2.341	0.375	0.00
Terrain_28	0.000	0.000	0.00	2.341	0.000	0.00
Terrain_29	9.716	3.134	7.108	10.813	4.847	17.881
Terrain_30	6.531	3.054	2.949	10.813	2.861	17.881

The following table provides data for resource capacity and consumption.

Vehicle Type	Fuel Type	Max Fuel	Idle Fuel Consumption	Non Idle Fuel Consumption	Number of Munitions	Number of Equipment	Max DI
M60_BRIDGE	Diesel	0.00	0.002103	0.027896295	0	0	0
M60A1	Diesel	1419.00	0.002103	0.027896295	0	0	0
M60_CHASSIS_WITHOUT_BRID	Gas	960.00	0.002103	0.027896295	0	0	0
M1_ABRAMS	Diesel	1909.20	0.0113562	0.0595149	4	0	0
M1A1_ABRAMS	Diesel	1909.20	0.0113562	0.0595149	5	0	0
M1A1_MINE_ROLLERS	Diesel	1909.20	0.0113562	0.0595149	5	1	0
M1A1_MINE_PLOWS	Diesel	1909.20	0.0113562	0.0595149	5	1	0
M1A2	Diesel	1909.20	0.0113562	0.0595149	5	0	0
M2A2	Diesel	662.00	0.0014721	0.018927	5	0	6
M3A2	Diesel	662.00	0.0014721	0.018927	5	0	2
M113A3	Diesel	360.00	0.0010515	0.01230255	2	0	12
M981	Diesel	360.00	0.0010515	0.01230255	2	0	0
M1064	Diesel	360.00	0.0010515	0.01230255	9	0	0
M93	Diesel	400.00	0.0000457402	0.0004574025	0	0	0
M88A2	Diesel	1514.0	0.002103	0.027896295	0	0	0
M728	Diesel	1457.40	0.002103	0.027896295	1	0	0
M9	Diesel	507.00	0.002103	0.027896295	0	0	0
M577A2	Diesel	454.00	0.0010515	0.01230255	0	0	0
M113	Diesel	360.00	0.0010515	0.01230255	2	0	12
M270	Diesel	738.0	0.0014721	0.018927	4	0	0
M109A5	Diesel	511.0	0.0014721	0.018927	11	0	0
M109A6	Diesel	503.4	0.0014721	0.018927	11	0	0
M998	Diesel	95.0	0.0000457402	0.0004574025	0	0	2
M966	Diesel	96.50	0.0000457402	0.0004574025	1	0	2
M1025	Diesel	95.00	0.0000457402	0.0004574025	4	0	2
M1043	Diesel	95.00	0.0000457402	0.0004574025	1	0	2
M1044	Diesel	95.00	0.0000457402	0.0004574025	1	0	2
M58A3_WITHOUT_ROCKET	Gas	0.0	0.0113562	0.0595149	1	0	0
M58A3_WITH_ROCKET	Gas	0.0	0.0113562	0.0595149	1	0	0
M977	Diesel	583.0	0.0003136624	0.0031366245	0	0	0

Vehicle Type	Fuel Type	Max Fuel	Idle Fuel Consumption	Non Idle Fuel Consumption	Number of Munitions	Number of Equipment	Max DI
M977_MINE_ROLLERS	Diesel	583.0	0.0003136624	0.0031366245	0	1	0
M977_MINE_PLOWS	Diesel	583.0	0.0003136624	0.0031366245	0	1	0
M978	Diesel	583.0	0.0003136624	0.0031366245	0	0	0
M984E1	Diesel	583.0	0.0003136624	0.0031366245	0	0	0
M985	Diesel	583.0	0.0003136624	0.0031366245	0	0	0
M985_MINE_ROLLERS	Diesel	583.0	0.0003136624	0.0031366245	0	1	0
M985_MINE_PLOWS	Diesel	583.0	0.0003136624	0.0031366245	0	1	0
M1078	Diesel	450.0	0.0000457402	0.0004574025	0	0	0
M1079	Diesel	450.00	0.0000457402	0.0004574025	0	0	0
M1083	Diesel	450.0	0.0000457402	0.0004574025	0	0	0
M1083_VOLCANO	Diesel	450.00	0.0000457402	0.0004574025	1	0	0
M1089_WINCH	Diesel	450.0	0.0000457402	0.0004574025	0	0	0
M1091_WINCH	Diesel	450.0	0.0000457402	0.0004574025	0	0	0
M992	Diesel	511.0	0.0014721	0.018927	0	0	0
MTU20_BRIDGE	Diesel	0.00	0.002103	0.027896295	0	0	0
MTU20	Diesel	960.00	0.002103	0.027896295	0	0	0
MTU20_CHASSIS_WITHOUT_BRIDGE	Diesel	960.00	0.002103	0.027896295	0	0	0
T80	Gas	1860.00	0.0113562	0.0595149	8	0	0
T80_WITH_MINE_PLOW_ROLLE	Gas	1860.00	0.0113562	0.0595149	8	2	0
T80UV	Gas	1860.00	0.0113562	0.0595149	8	0	0
T80UV_WITH_MINE_PLOW_ROLLER	Gas	1860.00	0.0113562	0.0595149	8	2	0
T72	Diesel	1200.00	0.0113562	0.0595149	6	0	0
T72_WITH_MINE_PLOW_ROLLE	Diesel	1200.00	0.0113562	0.0595149	6	2	0
T72BV	Diesel	1200.00	0.0113562	0.0595149	7	0	0
T72BV_WITH_MINE_PLOW_ROLLER	Diesel	1200.00	0.0113562	0.0595149	7	2	0
T64BV	Diesel	1000.00	0.002103	0.027896295	7	0	0
T64BV_WITH_MINE_PLOW_ROLLER	Diesel	1000.00	0.002103	0.027896295	7	2	0
T62	Diesel	960.00	0.002103	0.027896295	6	0	0
T62_WITH_MINE_PLOW_ROLLE	Diesel	960.00	0.002103	0.027896295	6	2	0
BMP1P	Diesel	460.00	0.0014721	0.018927	4	0	8
BMP1KSHM	Diesel	460.00	0.0014721	0.018927	0	0	8
BMP2	Diesel	460.00	0.0113562	0.0595149	5	0	6

Vehicle Type	Fuel Type	Max Fuel	Idle Fuel Consumption	Non Idle Fuel Consumption	Number of Munitions	Number of Equipment	Max DI
BMP3	Diesel	520.0	0.0113562	0.0595149	7	0	9
BRDM2	Gas	290.00	0.0003136624	0.0031366245	2	0	0
BRDM2_AT5_ATGM	Gas	290.00	0.0003136624	0.0031366245	1	0	0
MTLB_1V12	Diesel	450.00	0.0113562	0.0595149	1	0	0
BTR60P	Gas	290.00	0.0000457402	0.0004574025	2	0	8
BTR80	Diesel	290.00	0.0000457402	0.0004574025	3	0	8
BAT2	Diesel	1000.0	0.0014721	0.018927	0	0	0
BREM1	Diesel	1200.0	0.0010515	0.01230255	1	0	0
KMT5M	Diesel	0.0	0.002103	0.027896295	0	2	0
SPA_2S3	Diesel	851.00	0.0010515	0.01230255	2	0	0
SPA_2S1	Diesel	560.00	0.0014721	0.018927	6	0	0
ZSU23_4	Diesel	520.00	0.0010515	0.01230255	3	0	0
SA13SAM	Diesel	450.0	0.0014721	0.018927	1	0	0
SPA_2S6	Diesel	520.0	0.0010515	0.01230255	3	0	0
SPA_2S19	Diesel	343.0	0.0010515	0.01230255	3	0	0
SPA_2S23	Diesel	560.00	0.0014721	0.018927	6	0	0
SPA_2S31	Diesel	560.00	0.0014721	0.018927	6	0	0
SA15SAM	Diesel	450.0	0.0014721	0.018927	1	0	0
UAZ469B	Gas	78.00	0.0000457402	0.0004574025	0	0	0
GAZ66	Gas	210.00	0.0003136624	0.0031366245	0	0	0
KRAZ255B	Diesel	450.00	0.0003136624	0.0031366245	0	2	0
KRAZ255B_FUEL	Diesel	450.00	0.0003136624	0.0031366245	0	0	0
GMZ_TML	Diesel	850.00	0.0010515	0.01230255	4	0	0
CIS_2S12	Diesel	0.00			4	0	0
CHIEFTAIN	Diesel	950.0	0.002103	0.027896295	3	0	0
CHALLENGER	Diesel	1797.0	0.002103	0.027896295	4	0	0
WARRIOR	Diesel	770.0	0.0113562	0.0595149	3	0	0
AMX30	Diesel	970.0	0.002103	0.027896295	8	0	0
AMX40	Diesel	1100.0	0.0113562	0.0595149	5	0	0
AMX10RC	Diesel	530.0	0.0000457402	0.0004574025	6	0	0
AMX10	Diesel	530.0	0.0000457402	0.0004574025	8	0	0
LEO1A4	Diesel	900.0	0.0113562	0.0595149	6	0	0

Vehicle Type	Fuel Type	Max Fuel	Idle Fuel Consumption	Non Idle Fuel Consumption	Number of Munitions	Number of Equipment	Max DI
LEO2	Gas	1200.0	0.0113562	0.0595149	4	0	0
MARDER2	Diesel	652.0	0.0113562	0.0595149	4	0	0

2. MUNITIONS CHARACTERISTICS

To be interoperable with CCTT, the munitions capabilities and characteristics should consistent across all applications. This table identifies munitions understood by the CCTT simulation.

Munitions Type	Max Speed	Initial Speed	Time To Max Accel	Soft Flyout Time	Max Z Load Factor	Time In Flight Max	Missile Max Range
STINGER	662.58	0.0	2.445	2.0	30.0	9.43	5000.0
TOW2	329.184	0.0	2.445	2.0	25.0	14.8	3750.0
DRAGON	97.5	0.0	2.445	2.0	25.0	14.8	1000.0
HELLFIRE	387.27	0.0	2.445	2.0	25.0	25.8	8000.0
MAVERICK	331.0	0.0	2.445	2.0	25.0	17.0	4500.0
COPPERHEAD	687.0	0.0	2.445	2.0	25.0	57.0	28500.0
AT4	491.0	0.0	2.445	2.0	25.0	14.8	4500.0
JAVELIN	331.0	0.0	2.445	2.0	25.0	9.55	2000.0
MK82LGU	491.0	0.0	2.445	2.0	25.0	14.8	4500.0
MK82LGU_DLY_TENTH_SEC	83.0	0.0	2.445	2.0	25.0	60.0	5000.0
MK82LGU_DLY_QUARTER_SEC	83.0	0.0	2.445	2.0	25.0	60.0	5000.0
MK84LGU	83.0	0.0	2.445	2.0	25.0	60.0	3750.0
MK84LGU_DLY_TENTH_SEC	83.0	0.0	2.445	2.0	25.0	60.0	3750.0
MK84LGU_DLY_QUARTER_SEC	83.0	0.0	2.445	2.0	25.0	60.0	3750.0
SA13	670.96	0.0	2.445	2.0	30.0	13.04	7000.0
SA15	838.70	0.0	2.445	2.0	30.0	17.8848	12000.0

SA16	563.15	0.0	2.445	2.0	30.0	11.0983	5000.0
SA18	662.58	0.0	2.445	2.0	30.0	9.81	5200.0
SA19	662.58	0.0	2.445	2.0	30.0	15.0925	8000.0
RPG7VAT	491.0	0.0	2.445	2.0	25.0	14.8	4500.0
SAGGER	300.0	0.0	2.445	2.0	25.0	23.0	4000.0
SPIGOT	300.0	0.0	2.445	2.0	25.0	11.0	4000.0
SPANDREL	250.0	0.0	2.445	2.0	25.0	19.0	4000.0
SPIRAL	225.0	0.0	2.445	2.0	25.0	14.5	5000.0
SAXHORN	250.0	0.0	2.445	2.0	25.0	7.5	1500.0
SONGSTER	331.29	0.0	2.445	2.0	25.0	10.0	4000.0
STABBER	331.29	0.0	2.445	2.0	25.0	15.0	5500.0
SNIPER	491.0	0.0	2.445	2.0	25.0	15.0	5500.0

3. SPECIAL EFFECTS

The only special effects included in CCTT are flares. Smoke of several types is supported. Tactical smoke is discussed under relocatable objects. Exhaust smoke from engine start is handled by the Synthetic Environment Manager (SEM) only after it is detached from the vehicle/simulator. There are many different types of animations for weapons effects and for moving models but these are discussed by munition and model in other sections. Flares are not managed by the SEM in CCTT but are artillery/mortar launched only. Flares are modeled as entities producing entity state PDUs as they burn. Flares produce effects in the scene displayed through the manned simulators and the AAR and also change the “view” of the world that the CGF forces view.

Because of limited visual system processing power only one flare is modeled at any time. The local host picks the flare closest to its position and displays only that flare with the full light activated. Other flares, which may be currently active, show as just a white dot in the visual system. Because of this each entity does perceive the synthetic world slightly differently. CGF entities model the one flare closest to their position for the purpose of washing out night vision or improving detection for vehicles that do not have night vision.

4. PREPOSITIONED OBJECTS

The characteristics of a prepositioned object is an object that is anchored to the terrain, is pre-distributed as part of the correlated database process, has multiple states, and has a default state at exercise initialization. A prepositioned object is uniquely identified by its Object Identifier Record that consists of Site/Application/Object ID. The Object ID will be contained in each of the correlated databases, and thus will be known at the time of database initialization. The Object ID is unique for each prepositioned object. The Site and Application ID for a prepositioned object is the Site and Application ID of the Environment Manager. For CCTT, the prepositioned objects include buildings and stationary bridges.

5. THE ENVIRONMENT MANAGER AND RELOCATABLE OBJECTS

The Environment Manager controls all prepositioned and relocatable objects in the simulation. It maintains relocatable states. It should be queried by a simulator in order to determine the nature of the contents of the relocatable database. The Environment Manager's Site/Application ID and Port Address are sent to each application as part of the Simulation Manager initialization sequence. Other applications communicate changes to elements in the relocate database, including creation or destruction, via the Detonation PDU, the Point Object State PDU, the Linear Object State PDU, and the Areal Object State PDU using this information. The Environment Manager does not manage flares.

By making the Environment Manager the owner of the dynamic, synthetic environment objects, the update process for reset, restart, reconstitute, latecomers, and damage assessment on objects will be centralized. Only one processor will need to maintain the master list of object states in the environment for check pointing.

Of the relocatable objects listed below, only tactical smoke cannot be pre-positioned. Additional to relocatable objects, there are pre-positioned/terrain feature objects such as buildings and bridges that have damage states that are managed by the Synthetic Environment Manager. Interoperability of a simulator system requires only interaction (collision, visuals) with objects such as these.

The CCTT system provides the following relocatable objects:

- 1) Abatis

- 2) Log Crib
- 3) Minefields
- 4) Minefield lane Markers
- 5) Ribbon Bridges
- 6) AVLBs
- 7) Tank ditches
- 8) Concertina Wire
- 9) Craters
- 10) Infantry Fighting Positions (Infantry Fighting Position, Machine Gun Prepared Position, Overhead Covered)
- 11) Vehicle Defilades (Armored Vehicle, Fighting Vehicle, Mortar Carrier, Tank)
- 12) Tactical Smoke

Refer to the IEEE Standard 1278.1-1995 for details on the PDU structure and content. The following tabulations and information is provided for the Point, Linear, and Areal Object State PDUs. Modifications to the state of a relocatable is not specifically supported by the PDU structure so, a full state update needs to be transmitted to effect the modification of a relocatable's state.

POINT OBJECT STATE PDU

Field Size (bits)	POINT OBJECT STATE PDU FIELDS	
96	PDU Header	Protocol Version - 8-bit unsigned integer
		Exercise ID - 8-bit unsigned integer
		PDU Type - 8-bit enumeration
		Protocol Family - 8-bit enumeration
		Time Stamp - 32-bit unsigned integer
		Length - 16-bit unsigned integer
		Padding - 16-bits unused
48	Object Id	Site - 16-bit unsigned integer
		Application - 16-bit unsigned integer
		Object - 16-bit unsigned integer
48	Referenced Object Id	Site - 16-bit unsigned integer
		Application - 16-bit unsigned integer
		Object - 16-bit unsigned integer
16	Update Number	16-bit unsigned integer
8	Force ID	8-bit enumeration
8	Modifications	8-bit enumeration
32	Object Type	Domain - 8-bit enumeration
		Object Kind - 8-bit enumeration
		Category - 8-bit enumeration
		Subcategory - 8-bit enumeration
192	Object Location	X - Component - 64-bit floating point
		Y - Component - 64-bit floating point
		Z - Component - 64-bit floating point
96	Object Orientation	Psi - 32-bit floating point
		Theta - 32-bit floating point
		Phi - 32-bit floating point
48	Object Appearance	48-bit record of enumerations
16	Padding	16 bits unused
32	Requestor ID	Site - 16-bit unsigned integer
		Application - 16-bit unsigned integer
32	Receiving Id	Site - 16-bit unsigned integer
		Application - 16-bit unsigned integer
32	Padding	32 bits unused

Total Point Object State PDU size = 704 bits

Point Object PDU Description

This PDU communicates the addition/modification of a Synthetic Environment object which is geometrically anchored to the terrain with a single point.

Object ID: unique identification of a Synthetic Environment object in an exercise

Referenced Object ID: identification of the Synthetic Environment object with which this point object is associated.

Note: In most cases, (and possibly all cases for CCTT), the point object will not be associated with any other Synthetic Environment object, in which case this field is set to a system defined Null Object ID.

Receiving ID: identifies the Site/Application ID of the simulation application that is to receive the Object State PDU. This should be set to the Environment Manager Site/Application by an application that is sending to the Environment Manager. The Environment Manager will set this field to "all Site/Applications" when sending Object State PDUs to the applications in the exercise.

Update Number: uniquely identifies each state transition of an individual object

Force ID: identifies the force that created/modified the object

Modifications: indicates whether modifications have been made to the point object's location and orientation

Object Appearance: represents the state of the point object's appearance attributes

Object Type: defines the type of Synthetic Environment object.

Object Location: location in world coordinates of the Synthetic Environment object. This location corresponds to the origin of the Point Object model, where the z value is the height of terrain at the (x, y) position.

Object Orientation: orientation of the Synthetic Environment object, where the origin of the object is at Object Location.

Requestor ID: identifies the Site/Application ID of the simulation application sending the Object State PDU to the Environment Manager.

LINEAR OBJECT STATE PDU

Field Size (bits)	LINEAR OBJECT STATE PDU FIELDS	
96	PDU Header	Protocol Version - 8-bit unsigned integer
		Exercise ID - 8-bit unsigned integer
		PDU Type - 8-bit enumeration
		Protocol Family - 8-bit enumeration
		Time Stamp - 32-bit unsigned integer
		Length - 16-bit unsigned integer
		Padding - 16-bits unused
48	Object Id	Site - 16-bit unsigned integer
		Application - 16-bit unsigned integer
		Object - 16-bit unsigned integer
48	Referenced Object Id	Site - 16-bit unsigned integer
		Application - 16-bit unsigned integer
		Object - 16-bit unsigned integer
16	Update Number	16-bit unsigned integer
8	Force ID	8-bit enumeration
8	Number of Segments (n)	8-bit unsigned integer
32	Requestor Id	Site - 16-bit unsigned integer
		Application - 16-bit unsigned integer
32	Receiving Id	Site - 16-bit unsigned integer
		Application - 16-bit unsigned integer
32	Object type	Domain - 8-bit enumeration
		Object Kind - 8-bit enumeration
		Category - 8-bit enumeration
		Subcategory - 8-bit enumeration
N * 448	Segment Number	8-bit unsigned integer
	Segment Modifications	8-bit enumeration
	Segment Appearance	48-bit record of enumerations
	Segment Location	X - Component - 64-bit floating point
		Y - Component - 64-bit floating point
		Z - Component - 64-bit floating point
	Segment Orientation	Psi - 32-bit floating point
		Theta - 32-bit floating point
		Phi - 32-bit floating point
	Segment Length	16-bit unsigned integer
	Segment Width	16-bit unsigned integer

Field Size (bits)	LINEAR OBJECT STATE PDU FIELDS	
	Segment Height	16-bit unsigned integer
	Segment Depth	16-bit unsigned integer
	Padding	32 bits unused

Total Linear State PDU size = $(320 + 448n)$ bits where n= number of segments

Linear Object State PDU Description

This PDU communicates the addition/modification of a Synthetic Environment object which is geometrically anchored to the terrain with two points per segment.

Object ID: unique identification of a Synthetic Environment object in an exercise

Referenced Object ID: identification of the Synthetic Environment object with which this linear object is associated.

Note: In most cases, (and possibly all cases for CCTT), the linear object will not be associated with any other Synthetic Environment object, in which case this field is set to a system defined NULL_OBJECT_ID.

Receiving ID: identifies the Site/Application ID of the simulation application that is to receive the Object State PDU. This should be set to the Environment Manager Site/Application by an application that is sending to the Environment Manager. The Environment Manager will set this field to "all Site/Applications" when sending Object State PDUs to the applications in the exercise.

Update Number: uniquely identifies each state transition of an individual object

Force ID: identifies the force that created/modified the object

Object Type: defines the type of Synthetic Environment object

Number Segments: number of segment records in the linear object

Requestor ID: identifies the Site/Application ID of the simulation application sending the Object State PDU to the Environment Manager

Segment Number: individual segment number of the linear segment

Segment Modifications: indicates whether modifications have been made to the linear segment's location and orientation

Segment Appearance: represents the state of the linear segment's appearance attributes

Segment Location: location in world coordinates of the linear segment. The z value of the location is the height of terrain at the (x, y) value; the (x, y) value is located on the linear segment as depicted below:

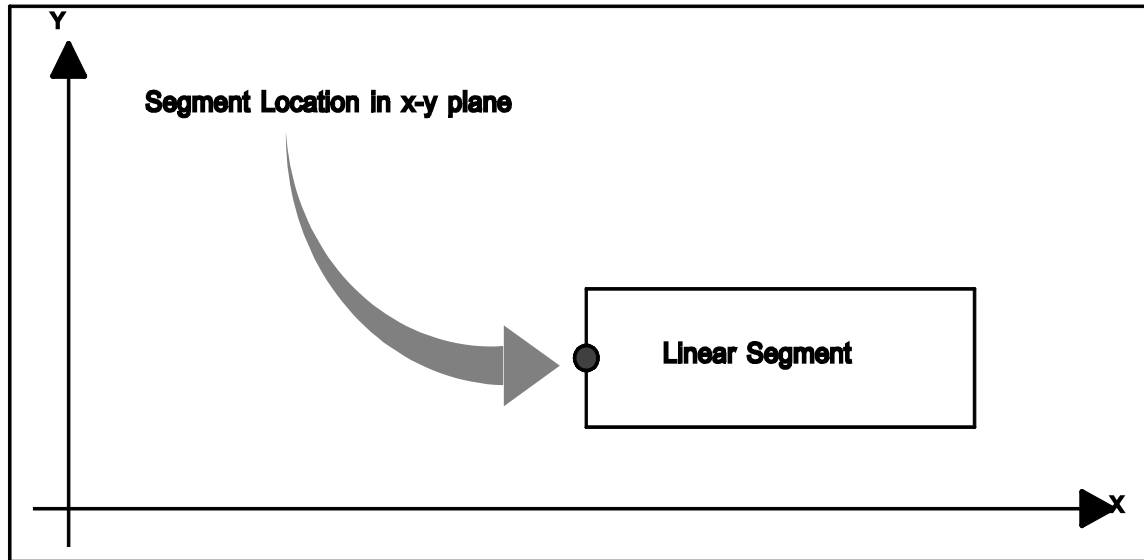


Figure 20 Segment Orientation: orientation of the linear segment about the Segment Location.

Segment Length: length of the linear segment, where the length extends in the positive X direction.

Segment Width: width of the linear segment, where 1/2 width extends in the positive Y direction and 1/2 width extends in the negative Y direction.

Segment Height: height of the linear segment above ground level.

Segment Depth: depth of the linear segment below ground level. (Note: The only linear segment within CCTT that has a depth associated with it is the Tank Ditch).

AREAL OBJECT STATE PDU

Field Size (bits)	AREAL OBJECT STATE PDU FIELDS	
96	PDU Header	Protocol Version - 8-bit unsigned integer
		Exercise ID - 8-bit unsigned integer
		PDU Type - 8-bit enumeration
		Protocol Family - 8-bit enumeration
		Time Stamp - 32-bit unsigned integer
		Length - 16-bit unsigned integer
		Padding - 16-bits unused
48	Object ID	Site - 16-bit unsigned integer
		Application - 16-bit unsigned integer
		Object - 16-bit unsigned integer
48	Referenced Object Id	Site - 16-bit unsigned integer
		Application - 16-bit unsigned integer
		Object - 16-bit unsigned integer
16	Update Number	16-bit unsigned integer
8	Force ID	8-bit enumeration
8	Modifications	8-bit enumeration
32	Object Type	Domain - 8-bit enumeration
		Object Kind - 8-bit enumeration
		Category - 8-bit enumeration
		Subcategory - 8-bit enumeration
48	Object Appearance	48-bit record of enumerations
16	Number of Points (n)	16-bit unsigned integer
32	Requestor Id	Site - 16-bit unsigned integer
		Application - 16-bit unsigned integer
32	Receiving ID	Site - 16-bit unsigned integer
		Application - 16-bit unsigned integer
n times 192	Object Location	X - Component - 64-bit floating point
		Y - Component - 64-bit floating point
		Z - Component - 64-bit floating point

Total Areal Object State PDU size = $(384 + 192n)$ bits
where n = number of points defining the areal

Arial Object State PDU Description

This PDU communicates the addition/modification of a Synthetic Environment object that is geometrically anchored to the terrain with a set of points (at least 3 points that come to a closure).

Object ID: unique identification of a Synthetic Environment object in an exercise

Referenced Object ID: identification of the Synthetic Environment object with which this areal object is associated.

Note: In most cases (and possibly all cases for CCTT), the linear object will not be associated with any other Synthetic Environment object, in which case this field is set to a system defined Null Object ID.

Update Number: uniquely identifies each state transition of an individual object

Force ID: identifies the force that created/modified the object

Modifications: indicates whether modifications have been made to any of the areal object's locations (Object Location1 through Object Location N).

Object Type: defines the type of Synthetic Environment object

Object Appearance: represents the state of the areal object's appearance attributes

Number of Points: total number of points making up the areal object

Requestor ID: identifies the Site/Application ID of the simulation application sending the Object State PDU to the Environment Manager

Receiving ID: identifies the Site/Application ID of the simulation application, which is to receive the Object State PDU. This should be set to the Environment Manager Site/Application by an application, which is sending to the Environment Manager. The Environment Manager will set this field to "all Site/Applications" when sending Object State PDUs to the applications in the exercise.

Object Location1: location in world coordinates of the first point making up the areal object, where the z value corresponds to the height of terrain at the (x, y) value.

Object Location2: location in world coordinates of the second point making up the areal object, where the z value corresponds to the height of terrain at the (x, y) value.

Object Location N: location in world coordinates of the Nth point making up the areal object, where the z value corresponds to the height of terrain at the (x, y) value.

Minefield Entry Event Report PDU

Variable Datum Description	Value
Minefield Entry Record	Datum ID: 42070 Datum Length/Value:

Simulation Applications that model minefields shall issue “Minefield Entry” Event Report PDUs to identify entities that pass through uncleared minefields. The Minefield Entry Event Report PDU will be issued immediately following the entry of an entity into an uncleared minefield. This Event Report PDU’s Event Type field 32-bit enumeration shall be set to the value 11.

Minefield Object Identifier - the Object ID assigned by the Synthetic Environment Manager to the minefield that was entered.

Intruder Entity Identifier - the identification of the entity that passed through the minefield.

The Minefield Entry Record (Datum ID #42070) Datum Specification Sub-record will be the only datum in the datum specification record of the Event Report PDU.

Relocatable Static Object Size

(Object_Data		
	DESTRUCTIBLE_BUILDING	DESTRUCTIBLE_STATIONARY_BRIDGE
(Entity_Length	8.00)	3.00)
(Entity_Width	6.00)	4.00)
(Entity_Height	3.00)	5.00)
(Hull_Length	8.00)	3.00)
(Hull_Width	6.00)	4.00)
(Hull_Height	3.00))	5.00))
	AIR_BURST_TACTICAL_SMOKE	GROUND_BURST_TACTICAL_SMOKE
(Entity_Length	3.00)	3.00)
(Entity_Width	4.00)	4.00)
(Entity_Height	5.00)	5.00)
(Hull_Length	3.00)	3.00)
(Hull_Width	4.00)	4.00)
(Hull_Height	5.00))	5.00))
	(RIBBON_BRIDGE	(AVLB_M60A1
(Entity_Length	6.92)	19.20)
(Entity_Width	8.13)	8.00)
(Entity_Height	0.50)	0.50)
(Hull_Length	6.92)	19.20)

(Hull_Width	8.13)	8.00)
(Hull_Height	0.50))	0.50))
	LOG_CRIB_RECTANGULAR	ABATIS_EIGHT_TREE
(Entity_Length	1.40)	42.00)
(Entity_Width	14.11)	23.50)
(Entity_Height	1.70)	8.80)
(Hull_Length	1.40)	42.00)
(Hull_Width	14.11)	23.50)
(Hull_Height	1.70))	8.80))
	CRATER_SMALL	CRATER_LARGE
(Entity_Length	2.03)	3.05)
(Entity_Width	5.08)	7.62)
(Entity_Height	0.01)	0.01)
(Hull_Length	2.03)	3.05)
(Hull_Width	5.08)	7.62)
(Hull_Height	0.01))	0.01))
	COVERED_MACHINE_GUN_BUNKER	MACHINE_GUN_PREPARED_POSITION
(Entity_Length	6.00)	6.00)
(Entity_Width	8.00)	8.00)
(Entity_Height	1.40)	1.40)
(Hull_Length	1.50)	1.50)
(Hull_Width	3.00)	3.00)
(Hull_Height	1.40))	1.40))
	ARMORED_VEHICLE_TURRET_HULL_D EFILADE	FIGHTING_VEHICLE_TURRET_HULL_DEF ILADE
(Entity_Length	34.10)	34.10)
(Entity_Width	8.64)	9.15)
(Entity_Height	2.51)	3.21)
(Hull_Length	34.10)	34.10)
(Hull_Width	8.64)	9.15)
(Hull_Height	2.51))	3.21))
	BREACH_LANE	MINEFIELD_MARKER
(Entity_Length	120.00)	120.00)
(Entity_Width	5.00)	5.00)
(Entity_Height	2.00)	2.00)
(Hull_Length	120.00)	120.00)
(Hull_Width	5.00)	5.00)
(Hull_Height	2.00))	2.00))

	MINEFIELD_CONVENTIONAL_RECTANGULAR	MINEFIELD_SCATTERABLE_OVAL
(Entity_Length	1.50)	3.00)
(Entity_Width	1.25)	4.00)
(Entity_Height	1.25)	5.00)
(Hull_Length	1.50)	3.00)
(Hull_Width	1.25)	4.00)
(Hull_Height	1.25))	5.00))
	BUILDING_RUBBLE	TANK_TURRET_HULL_DEFILADE
(Entity_Length	16.20)	34.10)
(Entity_Width	21.60)	9.58)
(Entity_Height	3.00)	28.1)
(Hull_Length	16.20)	34.10)
(Hull_Width	21.60)	9.58)
(Hull_Height	3.00))	28.1))
	FENCE	MORTAR_CARRIER_TURRET_HULL_DEFILADE
(Entity_Length	124.00)	34.10)
(Entity_Width	1.00)	8.64)
(Entity_Height	6.00)	2.28)
(Hull_Length	124.00)	34.10)
(Hull_Width	1.00)	8.64)
(Hull_Height	6.00))	2.28))
	AVLB_MTU20	DITCH
(Entity_Length	20.00)	136.00)
(Entity_Width	8.00)	9.50)
(Entity_Height	0.50)	7.70)
(Hull_Length	20.00)	136.00)
(Hull_Width	8.00)	9.50)
(Hull_Height	0.50))	7.70))
	OVERHEAD_COVERED_INFANTRY_POSITION	MINEFIELD_HASTY_RECTANGULAR
(Entity_Length	4.80)	1.50)
(Entity_Width	8.00)	1.25)
(Entity_Height	1.30)	1.25)
(Hull_Length	0.80)	1.50)
(Hull_Width	2.40)	1.25)
(Hull_Height	1.30))	1.25))
	INFANTRY_FIGHTING_POSITION	
(Entity_Length	5.00)	

(Entity_Width	6.00)	
(Entity_Height	1.30)	
(Hull_Length	0.70)	
(Hull_Width	2.00)	
(Hull_Height	1.30))	

6. ATMOSPHERE AND WEATHER

The natural environment representations for weather and atmosphere in CCTT are enumerated in Table 1 Natural Environment Representations. All environment data related to atmosphere and weather is set by the MCC and communicated to the participating applications using the Action Request PDU. Weather effects may be set before or at any time during the exercises. Effects are immediate and are database wide.

Attribute	Range	Datum Values	Description
Rain State	On Off	54000	Visibility attenuation due to rain
Rain Soak		57500	Rain Control
Haze State	On Off	58000	Attenuation of light by the atmosphere in areas not occupied by other obscurants
Haze Visibility Range	0-4.0 Km	58100	Visibility range within Haze in meters.
Haze Ceiling	4 Km	58430	Elevation in meters (from sea level) to top of haze
Fog State	On Off	55000	Enables or disables fog effects
Fog Visibility Range	0 – 700 meters	55100	Visibility range within Fog in meters.
Fog Ceiling	700 meters	55430	Elevation in meters (from sea level) to top of fog
Cloud State	On Off	53000	Cloud cover control
Cloud Visibility Range	0–3000 meters	53100	Visibility range within clouds in meters.
Cloud Ceiling	3000 meters	53300	Elevation in meters (from sea level) to top of cloud
Cloud Base	0–3000 meters	53200	Elevation in meters (from sea level) of cloud base.
Temperature	-20 -100	57100	Temperature in degrees

Attribute	Range	Datum Values	Description
			Celsius
Humidity	0 – 99	57200	
Wind Speed	Always 0	57410	No wind in CCTT
Lunar Illumination	None, Starlight, Half Moon, Full Moon	56250	

Table 1 Natural Environment Representations

7. DATABASES

This section describes the all correlated databases that are generated to support the CCTT synthetic environment. The CCTT visual database is displayed to the participants in a CCTT exercise by the visual system's image generator. The image generator includes the displays of the visual scene of the synthetic environment for the various viewpoints within the manned modules, the visual displays of the AAR and the TACP workstations, and the sensor displays for thermal, low light intensification, and laser range finding sensors within the manned modules. In addition, the visual database is also used to produce the 2D planned view displays, paper maps, and communications database as well as the computer-generated forces. The synthetic environment is made up of terrain features, the environmental phenomenology, and models of the moving and static entities.

7.1 CORRELATED DATABASE GENERATION

Figure 21 provides a conceptual overview of the CCTT synthetic environment database generation process showing the run-time and off line databases that comprise the synthetic environment.

The Evans and Sutherland (E&S) EaSIEST™ visual database generation system is used to develop the master visual database from the source data. The source form of the master visual database is an E&S proprietary format called the General Database Format (GDF).

The run time visual database is compiled from this GDF master visual database for execution on the E&S ESIG™ Image Generators (IG) to create the full color, 3-D visual scene viewed by the trainees. This database undergoes extensive editing to accommodate subject matter expert comments and image generator load testing for real-time operation.

The GDF database is also processed to extract selected data into the Standard Interchange Format (SIF) Database. This database is designed for use as an exchange media with other authorized users and training systems. For run-time use in the other CCTT subsystems, the GDF database is further processed to extract selected data into a CCTT-unique variant of SIF called SIF++. SIF++ is a logical extension of the standard SIF to accommodate specific requirements of the CCTT networked simulation that was not supported by the standard SIF format. At this time, the effort to generate all Combined Arms Tactical Trainers required correlated databases from the Synthetic Environment Data Representation and Interchange Specification (SEDRIS) is under contract for additional CATT programs.

A CCTT-specific application programmer's interface (API) is used to pre-process the SIF++ database into a program-specific API Database. This API database is optimized for compilation of the derived databases that are used by other subsystems of the trainer such as the MRTDB, MRSTDB, Communication, PVD and Environment Manager databases. These derived databases are closely correlated with the run-time visual database to ensure that all synthetic environment elements match the visual world seen by the trainee.

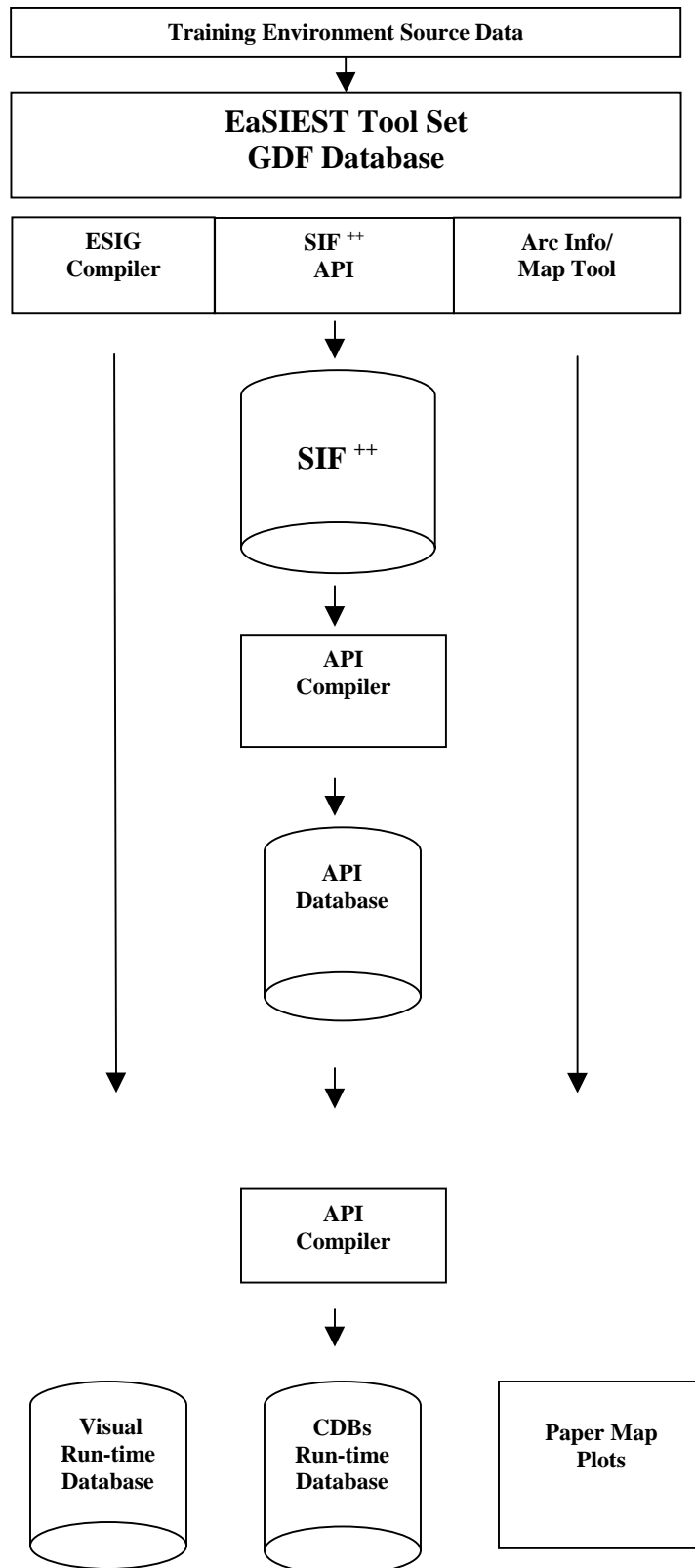


Figure 21 CCTT Synthetic Environment Database Generation Process

7.2 TRAINING ENVIRONMENTS

Three primary synthetic training environments are supplied with CCTT. Within each training environment the eye point has a visible range of 4000 meters for surrounding terrain and objects on the terrain. The only exceptions to the visible range are prominent navigational and tactically significant landmarks, which are visible out to 20 km.

The CCTT System is a ground-based application that requires a very dense visual scene of the training environment. Because of the role of features on the earth's surface in providing cover and concealment and in limiting the range of vision, the training environments provide equivalent characteristics for the areas being simulated. The tactically significant characteristics of the real world environment are accurately portrayed in the training environments. The training environments provide the features required to support evasive maneuvering including dodge and hide movements to avoid anti-armor missiles. The training environments provide routes that cover and conceal a vehicle's movement consistent with the contour interval of the associated 1:50,000 map.

7.3 PRIMARY ENVIRONMENTS

Each of the primary training environments represents the gaming areas. Maps of each primary environment conform to the DMA standards for 1:50,000 and 1:100,000 topographic maps and 1:250,000 Joint Operations Graphics (JOG) maps.

The Primary 1 training environment satisfies a complexity level consistent with the terrain and feature characteristics of the real world data of central Germany with SW coordinates of 50° 38' E and 08° 11' N and NE coordinates of 51° 59' E and 09° 39' N. The training environment represents a 100 x 150 km gaming area. Man-made features of the temperate forest training environment are characteristic of those found in the United States.

The Primary 2 training environment satisfies a complexity level consistent with the terrain and feature characteristics of real world data of the Army's National Training Center (NTC) at Fort Irwin, with SW corner coordinates of 117° W and 34° 15.0' N and NE corner coordinates of 115° 53.0' W and 35° 36.0' N. The training environment represents a 102 x 150 km gaming area.

The Primary 3 training environment satisfies a complexity level consistent with the terrain and feature characteristics of real world data of the Army's base at Fort Hood with SW corner coordinates of 98° W and 31° N and NE corner coordinates of 31° 29' W and 97° 30' N. The training environment represents a 46 x 53 km gaming area.

7.4 TRAINING ENVIRONMENT SOURCE DATA SPECIFICATION

The terrain for the primary training environments is implemented as a polygon skin defined by three levels of resolution: coarse, medium, and high. The coarse resolution skin covers 77% of the total gaming area and is derived from DMA Digital Terrain Elevation Data (DTED) level 1 or 2 data, with the resulting terrain fidelity equivalent to, or better than, DTED level 1 data. The medium resolution skin covers 20% of the total gaming area and is subdivided into regions located throughout the gaming area. The specific locations of the medium resolution regions are specified by PM CATT. The medium resolution skin has a terrain roughness equivalent to the roughest terrain represented by DMA DTED level 2 data. The high-resolution skin covers the remaining 3% of the total gaming area and is subdivided into terrain features (objects such as berms, river banks, etc.) located throughout the gaming area. PM CATT specifies the specific locations of the high resolution terrain features. The high-resolution skin provides those terrain

roughness characteristics that are so fine that they are not represented on a 1:50,000 map. The high-resolution skin represents terrain features as small as 0.5 meter.

When skinning the terrain, in no case is the difference in absolute elevation for corresponding points greater than 5 meters. For 50% of the terrain defined as medium resolution, the elevation is within 2 meters between corresponding points. The high-resolution terrain features agree within ± 0.3 meter of elevation with the corresponding location of the source data. The boundaries between the coarse, medium, and high terrain regions are blended to eliminate discontinuities and unnatural looking terrain and features. All features of tactical significance (as determined by the user) have been represented in the three primary environments.

7.5 VISUAL DATABASES

The terrain skin within 2400m identified as range 1 is maintained at full detail at all times, and no Level Of Detail (LOD) changes to the terrain skin occur. Range 2, the area from 2400m to 4000m is modeled with to allow terrain to relax to a lower grid density. In ranges 3 through 5, three successive transition ranges occur at: 4000m to 4900m, 4900m to 5600m and 5600m to 20,000m. Beginning at 4000m the terrain is rendered in low level of detail, sufficient enough to provide tactically significant objects and features for long-range viewing. Ranges 1-4 use an adaptive terrain skin algorithm to provide the highest level of detail possible, whereas range 5 consists of uniform 960m terrain facets. Prominent navigational and tactically significant landmarks remain visible out to 20km.

Each moving model is designed to give a thermal signature and has a set of 8 local polygon switch groups used for thermal mode that can be turned ON or OFF under host control. A host-specified intensity modifier applies to the ON state of each switch group. This allows for the representation of dynamic thermal effects, such as the heating and cooling of a tank gun during firing, or tank-track or road-wheel heating caused by normal movement. Special effects (such as hit flashes) are simulated using forced hot material codes.

Selectable Models States:

Undamaged

Damaged (exception: aircraft models)

Destroyed (exception: aircraft models)

Alternate – (e.g. Ramp down, Boom, Deployed tents - per model where applicable)

CCTT Model Set:

Refer to APPENDIX A – CCTT Model List for the list of required CCTT models.

7.6 TERRAIN DATABASES

Terrain database refers to the CGF Terrain Database. All components of the Terrain Database are read from the Terrain Database files stored on disk. The components include the Terrain Database Header, Pages, Patches, Terrain Features (which by definition include destructible static features), Feature Models (which by definition include dynamically placed feature models), and Terrain Elevation Posts.

Dynamically placed feature instances are not stored in the Terrain Database files since these are added at run-time.

The terrain databases are built via an off-line process, which transforms source visual data into the optimized terrain-reasoning database. The terrain-reasoning database is composed of a series of files. One group of files, collectively referred to as the Model Reference Terrain Database (MRTDB), provide a full 3D representation of the terrain. The other group of files, collectively referred to as the Multi-Level Routing Support Terrain Database (MRSTDB), provide abstract representations of the terrain environment (used by cross country routing and road routing, for example).

The CGF terrain database structure has two major components: the terrain database structure and the routing database structure. The terrain database and routing database supports terrain reasoning operations including height of terrain, height above terrain, provision of surface type, line of sight, area intervisibility, munition impact detection, route generation, route verification, collision detection, provision of cover locations, and provision of data in support of obstacle avoidance.

7.7 MODEL REFERENCE TERRAIN DATABASE

These database formats are crucial to functionality due to sizing, timing, and fidelity constraints balanced against maintainability and extensibility. As a result, the database formats are not straightforward data stores, but rather complex, tightly optimized structures arrived at via countless tradeoffs and design decisions. Poor database design can overwhelm available resources (memory and hard drive space) and render algorithm optimization useless. Some of the space saving techniques used in MRTDB includes fixed-point representations, local coordinate schemes, and separation of heavily repeated data from feature instances.

Each database file contains a validation header that is used to identify the version and kind of terrain database, thus allowing verification of compatibility between the different files, while also providing more useful error messages if necessary.

MRTDB is comprised of four kinds of data: the various headers (database header, page headers and patch headers) which contain information about a portion (or all) of the terrain; models which contain feature information common to many feature instances; elevation posts which make up the terrain skin; and features (including micro terrain) which populate the terrain skin.

The MRTDB terrain grid is comprised of various divisions and sub divisions. At the lowest level are grids. Grids are logical units useful only as a 4x4 subdivision of patches, the next higher unit. Sixteen (4x4) patches make up a page. Any number of pages makes up a terrain database. Each of these units is conceptually stored row-major within their parent unit. From the top down, the terrain is divided into some number of pages, numbered row-major. Each page is divided into 4x4 patches and each patch is broken into 4x4 grids. The figure below presents these ideas graphically.

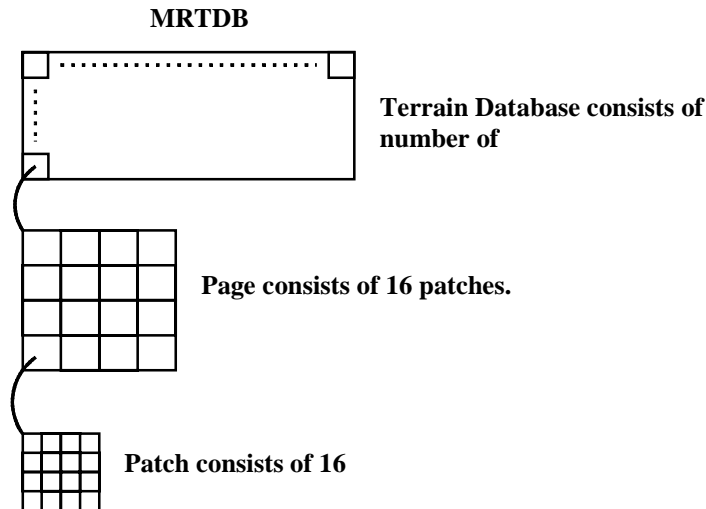


Figure 22 Graphical Representation of MRTDB

Pages are used to group terrain data together to facilitate caching operations. Thus, all posts, vertices, and features in a given page are stored together. Patches provide a manageable subdivision for accessing feature information within a page. Grids then provide a logical breakdown within a patch to provide further spatial organization of the features. They are referred to as logical because there is no grid header or other specific grid information stored in the terrain database. Other database objects reference grid numbers within a patch.

The MRTBD header file contains a number of database divisions and other supporting data that need not be cached or is relevant to the entire database. The headers illustrate several concepts of MRTDB design. For example, the page and patch headers provide organizational information to reduce the need to directly access the full dataset (i.e. to prevent caching). This reflects the fact that we will not be able to read in our entire database. As much processing as possible is done off-line to maximize run-time efficiency. An example of this is the river/bridge linkage, which helps us explicitly identify bridges in the database. Although this information could be calculated at initialization (or even on the fly during an exercise), it is stored in the database. Besides boosting performance, this allows independent verification of the resulting data set instead of a need to test algorithms that extract the data. Also the terrain type classification in the database header and the terrain type wet-dry mapping allow us to handle terrain types in a fully data-driven manner (i.e., the terrain number for "deep water" is not hard-coded to a single value, but rather is specified during database creation).

The headers file contains the following elements:

Validation Header: provides version and type information; supports error detection without exceptions.

Terrain Database Header: contains information relevant to the entire database.

Terrain Tables: provides mapping from dry to wet terrain types.

Road River Intersections: references pairs of road and river instances that intersect

Prepositioned Object (PO) Table: Provides an array of model indices for all of the prepositioned objects in database (table is indexed by the unique PO identifier). At run-time, this table may change as objects states are modified (the table stores the default "undamaged" state). Each model knows what model number corresponds to its various states, thus facilitating run-time transitions. Also, each of the prepositioned objects in the database have their unique Id, which permits them to look up their current model number.

Page Headers (stored row-major bottom to top within the terrain database): contains information for caching of page areas such as file offsets for local data.

Patch Headers (stored row-major bottom to top within the terrain database): contains information to facilitate retrieval of feature data.

The Feature Model Library is a set of feature models, where each model has a unique model Id. Each model maintains information about a feature that is common across many features. For instance, a tree model maintains the foliage opacity, foliage height, foliage radius, and trunk radius for a particular kind of tree. Each tree with the same attributes can then reference this tree model (via the model Id) to complete its definition, and since the model is stored only once, an enormous space savings can be realized. This idea can be extended from individual features to repeated sets of features that are placed throughout the database. In this case, a "feature" instance points to a model that is actually composed of many features, thus allowing the CGF database representation to minimize the space impact incurred the high feature density of CCTT databases. This is referred to as "aggregate models". The models for a given database are stored together in a separate file. The models file is always fully read in to memory.

The model file contains the following elements:

Validation Header: provides version and type information; supports error detection without exceptions.

Model Header: indicates how many of each of the following elements there are for file I/O.

Building Models: contains attributes common to buildings and references to corner list.

Building Corners: contains buildings corners stored as non-rotated offsets from a building's anchor (separating this list from the building models permitted arbitrary numbers of points to be stored for each building model without reserving the maximum number for each building model).

Aggregate Models: contains information about the aggregate model as a whole, including geometry of the footprint and references to the aggregate model tree list.

Aggregate Model Trees: contains trees within aggregate model, including offset and model reference

The MRTDB Pages file contains all data that is paged in/out of memory during run-time. The base terrain skin is stored as "posts" and cached separately, since there is a constant number of posts in a given region (i.e., memory fragmentation is not an issue). The "features" array contains a variety of information which is together used to describe actual (e.g., buildings, trees) or abstract (e.g., steep slopes, aggregate model) features. All features recognize which grid they are in, where a grid is a 4x4 subdivision of a patch. Feature retrieval operations then use the search area, in grid mask terms, to allow very fast 2D filtering operations which resolve to simple bit-wise operations. The posts for a given page are stored in

the pages file first in row-major order (across the entire page, i.e. without regard for patches) followed by each feature, which are stored in order first by patch then by the type of feature second.

The feature retrieval engine is the key to encapsulating terrain database format issues from accessing algorithms. A patch object is supplied search criteria (grid mask, feature type desired, etc.) and asked to retrieve matching features, one-by-one, for processing. This mechanism means large, complex algorithms (line of sight, collision detection, obstacle avoidance) are not impacted by changes in key storage representations. For example, buildings may be fully “placed” on the database (e.g., all corners of the building explicitly stored in 3-space for each instance) or “referenced” (e.g., instances only store the anchor point and an orientation), and accessing routines need not know the difference. The presence of aggregate models is also transparent to accessing routines. They simply query for trees and don't know if the trees are extracted from a placed feature instance or an aggregate model. Even destructible terrain can be handled transparent to these consuming routines, since the current state of the model is provided by the feature retrieval engine.

The page file contains the following elements:

Validation Header: provides version and type information; supports error detection without exceptions.

Posts and Features for Page 1

Posts and Features for Page 2

Posts and Features for Page N

Terrain types indicate the nature of the terrain surface at a given location. Examples of terrain types include asphalt road, sand, and swamp. Terrain types are used to identify a unique set of dynamic effects to be applied to vehicle dynamics, and are derived from the visual database material codes. The terrain types are mapped to a set of trafficability codes used to dynamically determine vehicle mobility. The terrain type at a given location may change based upon rain (e.g., dirt vs. mud).

7.8 MULTI-LEVEL ROUTING SUPPORT TERRAIN DATABASE

The Multi-Level Routing Support Database provides a representation of the terrain database that supports both road and cross-country routing. The routing files are stored separately from MRTDB files for several reasons. One reason is that the routing database uses different structures to support routing and therefore it is simpler to store the information separately. Second, it allows independent testing of the data set separate from the algorithms to help catch source data and format errors. Finally, it allows the database to be generated off-line rather than at initialization, thereby greatly increasing the speed of the initialization process of the routing system.

The routing database is comprised of three kinds of data: the various headers (routing database header, region headers) each of which contains information about all or a portion of the routing database, road route information, and cross country route information.

The routing capability of the environment allows both the generation of road and cross-country routes and the verification of cross-country routes. A road route is a route that exclusively uses the road networks in the database as a means of travel. A cross-country route does not use the road networks and therefore must be concerned with the terrain features. Cross-country routing is intended to be used as a unit level router in that it considers only large terrain features such as cities, no-go terrain areas, forests,

lakes, rivers, steep slopes and a subset of dynamic terrain. Cross-country routing will only consider tank ditches, mine fields, concertina wire and log cribs. Other dynamic terrain (such as a prepared fighting position) would be too small to interfere with a unit level route and therefore would be left for the entity level router. Route verification will be used to allow a user to pass in a proposed route that will be checked to see if it encounters any terrain features. If it encounters a terrain feature, the type of feature and the location on the route where the feature was encountered is returned to the caller so that the user can then modify the route.

Road route information is used to plan all road routes. The road networks are represented as a set of intersections and a set of segments that connect the intersections together to form a network. Each segment has information that is stored with it including its length, width, bridge and trafficability indicators, the intersections it connects and the number of points that define the segment. The figure below represents a segment graphically.

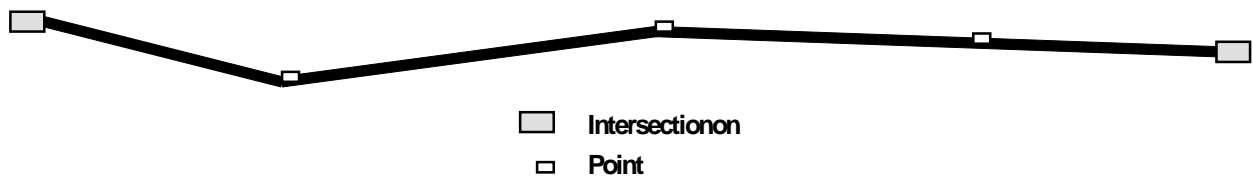


Figure 23 Segment

In addition to the intersections and segments, a segment/intersection pair is stored so that from any intersection we can determine how to get to any other intersection that is one segment away. The figure below illustrates that intersection A has 3 segment/intersection pairs: b/B, c/C and d/D. This representation of road networks allows for easy traversal of the road network. The entire road network is broken up into regions. The regions allow us to quickly search for a road when a user specifies a route point.

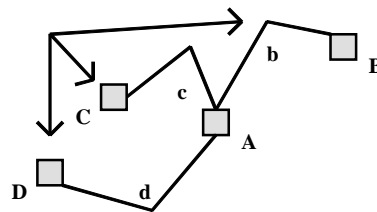


Figure 24 Segment/Intersection Pairs

Cross-country route information is used to plan all cross-country routes and consists of a visibility graph among a set of polygonal obstacles. The visibility graph is defined by finding all other nodes that are visible from a given node. The cross-country routing database is composed of a set of nodes that each contains a location and a list of other nodes that are visible, and the distance to the other nodes and a scaling factor that can affect the desirability of using this path. A cross-country obstacle is defined by a set of nodes and its extent along with the aggregate obstacle it belongs to. An aggregate obstacle is composed of one or more smaller obstacles. The reason aggregate obstacles are used is that calculating the visibility graph for a huge number of polygonal obstacles is time consuming and space inefficient. By using aggregate obstacles the visibility graph is only calculated for a smaller number of obstacles and will

be faster and smaller than calculating it for the entire set of obstacles. The figure below shows a cross-country visibility graph with only one node.

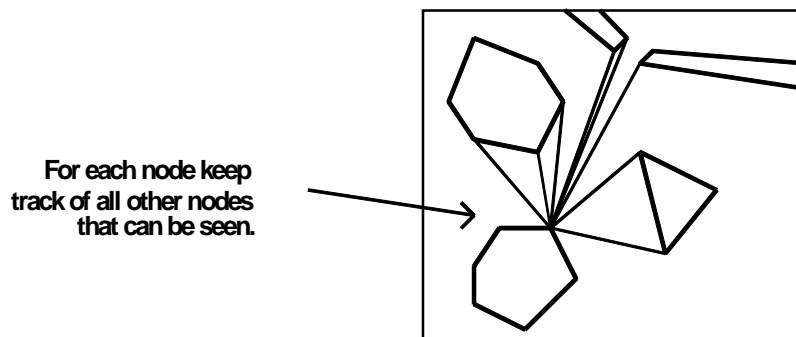


Figure 25 Cross Country Visibility Graph with One Node

Figure 26 represents the routing database graphically.

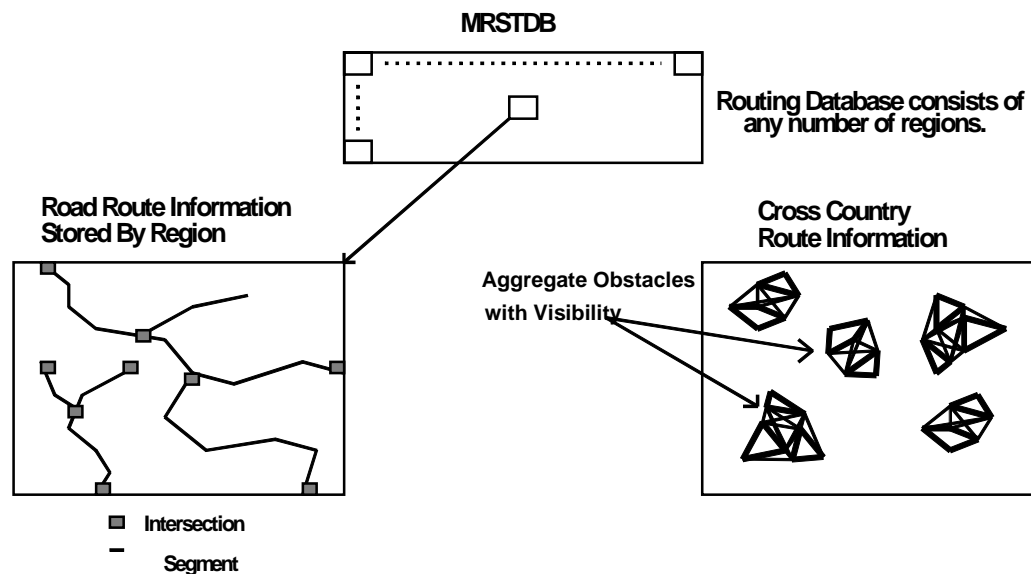


Figure 26 Graphical Representation of MRSTDB

7.9 PLAN VIEW DISPLAY DATABASE

The plan view display contains five databases that are currently derived from the CCTT SIF++. The PVD database process generates a High Detail, Medium Detail, Low Detail, Contour, and Fixed Selectable Feature Databases.

The PVD databases are generated off-line using the trainer support software Terrain API and PVD database compilers. The PVD terrain database includes all map features (fixed selectable and static) and terrain feature labels as well as derived information such as urban and forested areas. During an exercise, if any part of the terrain changes, it is up to the application to supply the PVD with the updated information if it is to be displayed. For example, in the case of the DI station, terrain updates are not given to the PVD because the PVD represents a static paper map for the soldier. However, the information is given to the AAR's PVD because it is necessary to depict the changing configuration of the terrain during AAR operation. The terrain database used by the PVD will have its origin (0,0) at the southwest most point of the terrain.

The terrain database consists of the following information: roads, railroad (yards, tracks), cart tracks, airports, runways, bridges, causeways, tunnels, dams, locks, rivers, canals, ditches, islands, fords, water mills, escarpments, embankments, cuts, fills, hedgerows, forests, individual trees, canopies, built-up areas, individual buildings, towers, power lines, wetlands, marshes, croplands, orchards, plantations, grasslands, pastures, brush land, scrub, shrubs, rock outcrops, open water, boundaries (International, National, State/Province, County, Township, Village, Reservation, Training Area), labels, and contour lines.

7.10 COMMUNICATION DATABASE

The radio contains one database that is comprised of high-resolution terrain skin being sampled at a resolution of a 64 meter triangulated regular network. The simulated terrain's propagation effects are modeled in the SINCGARS radio communication simulation. The radio model request elevation points, and distances to those elevation points, for the terrain along the line segment between a transmitting radio and the receiving radio. The terrain elevations supplied are average terrain heights for each of the terrain database patches, which are crossed by the line segment between a transmitting radio and the receiving radio. The terrain database patches are approximately 500 meters on a side.

7.11 DESTRUCTIBLE OBJECT/ENVIRONMENT MANAGER DATABASE

A destructible object is defined as a cultural feature, such as a building or tree. Terrain feature instances are stored on disk in the terrain database files generated by the CGF Terrain Compiler. Destructible static feature instances are stored on disk and thus are terrain features. Dynamically placed feature instances are not stored on disk and are not terrain features.

A destructible static feature is a terrain feature that is pre-placed in the visual feature and CGF databases and may change its state (geometry) at run-time. This term is a synonym for the visual term "fixed selectable feature". A destructible static feature may be in its normal state, damaged state, or destroyed state, and possesses a default state at initialization. For CCTT, destructible static features include buildings and stationary bridges.

A dynamically placed feature is a terrain feature that is created and placed at run-time. Once placed, a dynamically placed feature may change its state, where the possible states include normal, damaged, destroyed, or breached. These features are generally created by combat engineers. This term is a synonym for the visual terms: "relocatable object" and "re-positionable object". For CCTT, examples of dynamically placed features include tank ditches, concertina wire, tank defilade positions (four types), infantry fighting positions (three types), minefields, minefield lane markers, log cribs, abatis, craters, ribbon bridges, and the AVLB.

The Environment Manager owns all pre-positioned and relocatable objects. The Environment Manager and the other simulation applications communicate concerning the creation of and change to synthetic environment objects via the three Object State PDUs and the Detonation PDU. The following operations are supported by the Environment Manager:

- Creation of Relocatable Objects
- Modification of Pre-positioned or Relocatable Objects
- Deactivation of a Relocatable Object
- Reset and Latecomers
- Reconstitution and Restart

7.12 CORRELATION TESTING

Correlation of databases is verified using manual techniques that involve flying through the database using the AAR while ground lock is active. The level of correlation between the terrain database and the visual database is difficult to accurately measure however the following values have been observed:

Point features tolerance within 0.1 meters area.

Tolerance ~ 10 meters near extreme cut-n-fill areas

Terrain facets are 1 for 1

Capability Area: Synthetic Environment

Chap	ICD Paragraph Title	Capability Detail	Testable Attribute	Attribute Test Sequence	Entry Level Test / Drop Back Level					Test Approach			For DTS, Delivery Order (2, 3, future) to be Completed	Manual Test Method Available	Test Notes
					1	2	3	4	5	DIS Tool Test	Inspection during exercise	Code and/or Data File Inspection			
6	Entity Characteristics	Support for representing the physical characteristics of vehicle platforms in a manner that is consistent with the CCTT system.	sync_env_model_mass	4.1	N/A	N/A	N/A	3	N/A			Y			Reader file inspection and/or visual inspection from 3d viewer
			sync_env_model_dimemnsion	4.2	N/A	N/A	N/A	3	N/A		Y				Reader file inspection and/or visual inspection from 3d viewer
		Support for representing the performance characteristics of vehicle platforms in a manner that is consistent with the CCTT system.	sync_env_model_performance	4.3	N/A	N/A	N/A	3	N/A		Y	Y			Reader file inspection and/or visual inspection from 3d viewer
		Support for representing the physical characteristics of human lifeforms in a manner that is consistent with the CCTT system.	sync_env_model_human_mass	3.1	N/A	N/A	2	N/A	N/A		Y	Y			Reader file inspection and/or visual inspection from 3d viewer
		Support for representing the performance characteristics of human lifeforms in a manner that is consistent with the CCTT system.	sync_env_model_human_performance	4.4	N/A	N/A	N/A	3	N/A		Y	Y			Reader file inspection and/or visual inspection from 3d viewer
		Support of model munitions with characteristics consistent with that of the CCTT system.	sync_env_model_munition	4.5	N/A	N/A	N/A	3	N/A		Y	Y			Reader file inspection and/or visual inspection
		Support for displaying visual models for relocatable objects that are recognizable as the corresponding CCTT objects.	sync_env_relocatable_obj	3.2	N/A	N/A	2	N/A	N/A		Y				Reader file inspection and/or visual inspection from 3d viewer
		Support the response of collisions with relocatable objects that have collision volumes.	sync_env_relocatable_obj_collision	3.3	N/A	N/A	2	N/A	N/A		Y	Y			Reader file inspection and/or visual inspection from 3d viewer
		Support for displaying visually damaged models for relocatable objects that are recognizable as the corresponding CCTT objects.	sync_env_relocatable_obj_damage	4.6	N/A	N/A	N/A	3	N/A	Y	Y	Y			Reader file inspection and/or visual inspection from 3d viewer
		Support the creation of point relocatable objects by issuing a Point Object State PDU.	sync_env_pdu_point_obj_state	2.1	N/A	1	N/A	N/A	N/A	Y					
		Support the creation of linear relocatable objects by issuing a Linear Object State PDU.	sync_env_pdu_linear_obj_state	2.2	N/A	1	N/A	N/A	N/A	Y					
		Support the creation of areal relocatable objects by issuing an Areal Object State PDU.	sync_env_pdu_areal_obj_state	2.3	N/A	1	N/A	N/A	N/A	Y					
		Support the relocatable object PDU format.	sync_env_pdu_relocatable_obj_object_id	2.4	N/A	1	N/A	N/A	N/A	Y					
			sync_env_pdu_relocatable_obj_update_number_create	2.5	N/A	1	N/A	N/A	N/A	Y					
			sync_env_pdu_relocatable_obj_update_number_increment	2.6	N/A	1	N/A	N/A	N/A	Y					

Capability Area: Synthetic Environment

Chap	ICD Paragraph Title	Capability Detail	Testable Attribute	Attribute Test Sequence	Entry Level Test / Drop Back Level					Test Approach			For DTS, Delivery Order (2, 3, future) to be Completed	Manual Test Method Available	Test Notes
					1	2	3	4	5	DIS Tool Test	Output/Visual Inspection during exercise	Code and/or Data File Inspection			
6	Entity Characteristics	Support the Minefield Entry Event Report PDU.	sync_env_pdu_minefield_entry	2.7	N/A	1	N/A	N/A	N/A	Y					
		Issue a Fire PDU when an entity is determined to be eligible to detonates a mine.	sync_env_pdu_minefield_fire	2.8	N/A	1	N/A	N/A	N/A	Y	Y				
		Issue a Detonate PDU when an entity is determined to be eligible to detonate a mine.	sync_env_pdu_minefield_detonate	2.9	N/A	1	N/A	N/A	N/A	Y	Y				
	Atmosphere and Weather	Support "Rain State" control.	sync_env_atm_rain_state	3.4	N/A	N/A	2	N/A	N/A		Y				Assuming this means MCC issues changes in environment and the AUT reacts accordingly.
		Support "Rainsoak" control.		4.7	N/A	N/A	N/A	3	N/A		Y				Assuming this means MCC issues changes in environment and the AUT reacts accordingly.
		Support "Haze State" control.	sync_env_atm_haze_state	3.5	N/A	N/A	2	N/A	N/A		Y				Assuming this means MCC issues changes in environment and the AUT reacts accordingly.
		Support "Haze Visibility Range	sync_env_atm_haze_visibility	4.8	N/A	N/A	N/A	3	N/A		Y				Assuming this means MCC issues changes in environment and the AUT reacts accordingly.
		Support "Fog State" control.	sync_env_atm_fog_state	3.6	N/A	N/A	2	N/A	N/A		Y				Assuming this means MCC issues changes in environment and the AUT reacts accordingly.
		Support "Fog Visibility Range" control.	sync_env_atm_fog_visibility	4.9	N/A	N/A	N/A	3	N/A		Y				Assuming this means MCC issues changes in environment and the AUT reacts accordingly.
		Support "Cloud State" control.	sync_env_atm_cloud_state	3.7	N/A	N/A	2	N/A	N/A		Y				Assuming this means MCC issues changes in environment and the AUT reacts accordingly.
		Support "Lunar Illumination" control.	sync_env_atm_lunar_illumination	3.8	N/A	N/A	2	N/A	N/A		Y				Assuming this means MCC issues changes in environment and the AUT reacts accordingly.

Capability Area: Synthetic Environment

Chap	ICD Paragraph Title	Capability Detail	Testable Attribute	Attribute Test Sequence	Entry Level Test / Drop Back Level					Test Approach			For DTS, Delivery Order (2, 3, future) to be Completed	Manual Test Method Available	Test Notes
					1	2	3	4	5	DIS Tool Test	Inspection during exercise	Code and/or Data File Inspection			
6	Training Environments	Support 4000 meter visibility for surrounding terrain and objects on the terrain.	sync_env_database_visibility_4k	3.9	N/A	N/A	2	N/A	N/A		Y				Visual Inspection during run
		Support 20k meters visibility for prominent navigational and tactically significant landmarks.	sync_env_database_visibility_20k	3.10	N/A	N/A	2	N/A	N/A		Y				
	Primary Environments	Support Primary 1 database	sync_env_database_p1	3.11	N/A	N/A	2	N/A	N/A		Y				
		Support Primary 1 database correlation.	sync_env_database_p1_collreation	3.12	N/A	N/A	2	N/A	N/A		Y				
		Support all CCTT p1 models.	sync_env_database_p1_models	4.1	N/A	N/A	N/A	3	N/A		Y				
		Support Primary 1 database for 5 levels of detail.	sync_env_database_p1_5_levels	4.11	N/A	N/A	N/A	3	N/A		Y				
		Support OTW scene for p1 database	sync_env_database_p1_otw	3.13	N/A	N/A	2	N/A	N/A		Y				
		Support IR scene for p1 database	sync_env_database_p1_ir	3.14	N/A	N/A	2	N/A	N/A		Y				
		Support Primary 2 database	sync_env_database_p2	3.15	N/A	N/A	2	N/A	N/A		Y				
		Support Primary 2 database correlation.	sync_env_database_p2_collreation	3.16	N/A	N/A	2	N/A	N/A		Y				
		Support all CCTT p2 models.	sync_env_database_p2_models	4.12	N/A	N/A	N/A	3	N/A		Y				
		Support Primary 2 database for 5 levels of detail.	sync_env_database_p2_5_levels	4.13	N/A	N/A	N/A	3	N/A		Y				
		Support OTW scene for p2 database	sync_env_database_p2_otw	3.17	N/A	N/A	2	N/A	N/A		Y				
		Support IR scene for p2 database	sync_env_database_p2_ir	3.18	N/A	N/A	2	N/A	N/A		Y				
		Support Primary 3 database	sync_env_database_p3	3.19	N/A	N/A	2	N/A	N/A		Y				
		Support Primary 3 database correlation.	sync_env_database_p3_collreation	3.20	N/A	N/A	2	N/A	N/A		Y				
		Support all CCTT p3 models.	sync_env_database_p3_models	4.14	N/A	N/A	N/A	3	N/A		Y				
		Support Primary 3 database for 5 levels of detail.	sync_env_database_p3_5_levels	4.15	N/A	N/A	N/A	3	N/A		Y				
		Support OTW scene for p3 database	sync_env_database_p3_otw	3.21	N/A	N/A	2	N/A	N/A		Y				
		Support IR scene for p3 database	sync_env_database_p3_ir	3.22	N/A	N/A	2	N/A	N/A		Y				

CHAPTER SEVEN – IMAGE GENERATOR

The Image Generator (IG) provides real time visual and sensor displays of the training environment for all simulated viewpoint positions and attitudes. The computer image generator imagery changes with and is dictated by real time movement through the environment, engagement actions taken, and the actions of all modules and consoles in the battle scenario.

1. PERFORMANCE CHARACTERISTICS

The following are the performance characteristics for the current visual system that includes, an Evans and Sutherland ESIG 4530 and the current field of view configurations. The pixel and polygon counts are based on the current binary separation plane database design. Additional pixel and polygon performance is required when using a z buffered database and system architecture. Refer to Chapter 6, Synthetic Environment for additional information.

1.1 POLYGON CAPACITY

The nominal polygon capacity for a channel with an update rate of 15 Hz is 6000 polygons per channel. Refer to APPENDIX A for specific CCTT channel polygon loads.

1.2 PIXEL CAPACITY

Each channel sustains a minimum of 90 Mpixels/sec. This channel rate is maintained while displaying 1024 X 768 resolution at a 15 Hz update rate.

1.3 TEXTURE MAPS

The IG supports a range of texture map sizes up to 512 x 512 as a maximum. The IG provides a minimum of 4 M texels in Random Access Memory (RAM).

1.4 UPDATE RATE

The minimum update rate of the Host to IG interface is 15Hz. The position and attitude data for the viewpoint and all moving models is updated and a complete scene is computed at a rate not less than 15 Hz.

1.5 DIURNAL EFFECTS

Two modes for time of day are selectable:

Static - The CIGS provides five levels of natural illumination to simulate day, overcast day, dawn and dusk, moonlit night, and starlit night. Additional night illumination appropriate for night vision light intensification devices is provided.

Continuous Time of Day – Automatic, gradual illumination changes to simulate continuous time of day is provided. Appropriate adjustments in contrast, color, and intensity of objects occurs in the displayed image to depict the selected time of day. An interpolation from the static defaults may be made

based on the current hour, minute and second. The intensity and position of the illumination source is represented.

1.6 FIELD OF VIEW

The Field of View (FOV) does not directly drive requirements to be interoperable with CCTT because it is specifically configured for different visual channels. The Manned Module FOV is included in this document because it directly impacts fair fight. For example SIMNET would be at a disadvantage in an exercise with CCTT as a result of reduced simultaneous visual scene. Refer to APPENDIX A for CCTT Manned Module FOV requirements and APPENDIX B for CCTT Manned Module Display Configurations.

1.7 HEAD TRACKING

Head tracking is employed to monitor head motion, as the trainee moves his eye point throughout the viewing volume, the image generator recomputes the instantaneous image viewpoint for each associated active monitor. The recomputation of the image provides the trainee with a perception of parallax to provide enhanced distance cues and an increased sense of depth and the ability to move the instantaneous field of view in a natural manner. This allows the trainee to see around nearby objects or to see objects which are in the gaps between vision blocks or otherwise immediately outside of the current viewing area.

1.8 LEVELS OF DETAIL

The IG processes the visual database, which includes 5 Levels of Detail (LOD). The highest LOD is maintained at full detail near the computed eye point of each channel. Each channel has a minimum visible range of 4000 meters. Beginning at 4000m the terrain is rendered in low level of detail, sufficient enough to provide tactically significant objects and features for long-range viewing. Ranges greater than 5600m from the computed eye point of the channel are displayed at a lower resolution that consists of uniform 960m terrain facets. Prominent navigational and tactically significant landmarks remain visible out to 20km.

2. TARGET DETECTION & RECOGNITION

Target detection and recognition heights are measured in meters. Johnson's criteria is used. The terms "detection" and "recognition" are equivalent to their definitions in Johnson's criteria, and are repeated below. The specific ranges listed below are based on the standard target, 2.5 meters in height.

Detection - An object is present. Requires 1.5 active scanning TV lines across the object. Refer to APPENDIX A- CCTT Display Configurations for detection ranges and display resolutions.

Recognition - The class to which an object or target belongs may be discerned, e.g., a small vehicle (like a jeep), a mid-sized vehicle (like an M1), and a transport aircraft. Requires 7.5 active scanning TV lines across the object. Refer to APPENDIX A- CCTT Display Configurations for recognition ranges and display resolutions.

The specific image sharpness requirements are based on the use of reasonably effective anti-aliasing and a Kell factor of 0.7. The ratio of vertical to horizontal resolution (in arc-minutes/OLP) varies no more than 0.8 to 1.2.

Image motion of up to 15 degrees per second does not degrade sharpness by more than 20 percent. Vernier resolution, measured as the minimum discernible apparent displacement of adjacent scene elements and as the minimum detectable relative motion of a scene element relative to the eye, is less than 20 percent of the resolution (Optical Line Pair (OLP) spacing) specified for each display.

3. THERMAL IMAGE-INTENSIFICATION

Thermal image simulation is a function of the Run Time Software (RTS) based on polygon material code attributes. Simulation of the scene, as viewed through low-light sensors, is achieved by an alternate color palette.

The thermal images are generated about the instantaneous optical line-of-sight of the thermal receiver optics. One of four environmental thermal conditions: wet hot day, dry hot day, wet cold day, and dry cold day for the database are selectable.

Special database attributes are provided to more accurately model the real world as seen by a thermal sensor. Material codes assigned to each polygon are used to support thermal simulation. Processing is performed to convert the material code to the appropriate monochrome intensity value for existing conditions such as time of day.

Thermal conditions are simplified representations of thermal imagery, which provides a generally correct appearance for all objects for a given time of day, temperature and atmospheric condition. Thermal signature simulation may be absolute in thermal representation and simplified by creating generic thermal signatures by type of model e.g., tank, armored personnel carrier, wheeled armored, truck, etc. Simulation of thermal signatures emitted through tactical smoke, fog, and vegetation is required. A method is employed to ensure that displayed thermal intensity is a function of material type. The effects of atmospheric attenuation are computed in real time using a fading function appropriate to infrared. The simulated thermal image simulates thermal noise to the thermal imagery video to produce a realistic appearance. The thermal image simulation exhibits the response to operator manipulation of sensitivity, gain, contrast and other controls applicable to each vehicle to approximate the relationship between control settings, environmental conditions, and the displayed imagery. Both white-hot and black-hot modes are simulated.

4. LOW-LIGHT AMPLIFICATION

The low light amplification provides a realistic simulation of the use of low light level vision intensification equipment via NVG and installed equipment in each vehicle. The installed intensification simulation is done with a simulated instrument having the look and feel of operational equipment and existing module/console display assets.

When simulating instruments of the operational intensification equipment, operational mechanical adjustment features and electrical controls are simulated. NVG has an on/off switch. The options include an overcast condition and three phases of lunar illumination (0 (starlight only), 1/2, and full moon). The lunar phase and illumination levels correspond to real world conditions.

A simulated blooming effect is achieved for fires, flares, detonations, and muzzle flashes with enlarged polygons and the brightest color intensity possible. These enlarged polygons are only visible in the night vision mode. In addition, real-time gamma correction is used to provide the distinctive hue of the light-amplifying device.

5. DATABASE PAGING

The IG database paging method allows for a minimum of 64 static models and 16,384 fixed selectable models. The IG allows for paging of all model selects, fast model paging and fast paging of new areas. The 'highest-power magnification' information is used to determine paging reach in order to prevent holes.

6. MOVING MODELS

The IG processes a minimum of 192 simultaneous and independent, relocatable, or switchable moving models, which include up to 3 articulated parts. At a 15 Hz update rate, models are unrestricted across all channels, and are visible in the OTW channels and sensor channel slaved to that viewpoint. Moving models have the ability to be displayed on specific channels. A moving model is any model from the model library, which requires a separate dynamic coordinate system. Any database model may be bound to a moving-model motion system in order to produce a moving model. The moving models do not limit or are limited by any of the weapon effects. The motion dynamics of each moving model including articulated parts are generated by the Host computer and transferred to the IG through the Host/IG interface. The average number of articulated parts is 3 but may go to a maximum of 16 through level of detail switching. The system must simultaneously support all the positioning, environment feedback and display processing associated with columns I, II and III.

Table 2

	I In Active Area For Each	II Displayed Per Module / Console	III Displayed Per Channel
Module / Console Vehicles	150	100	20
Immobilized Vehicles	50	35	10
In-Flight Missiles / Projectiles	35	20	5
Animation and Special Effects	35	20	5
Misc. Relocatable Objects	20	10	5
Tactical Smoke	15	7	3

The above listed quantities define a specific, nominal test situation which the module's/console's system are able to accommodate. A scene management process provides real-time reallocation of processing resources to accommodate other combinations of entities.

Clarifications for column II:

These quantities are based on an idealized module/console, which is simultaneously displaying a composite 360 degrees of instantaneous HFOV. The required models for each module/console are the ratio of the composite HFOV to the idealized HFOV. The composite HFOV are understood to be the sum total of the instantaneous HFOV (use true HFOV for magnified images) for all simultaneously active displays (based on worst case situation regarding simultaneously active displays).

Where the composite HFOV for a particular module/console is more or less than 360 degrees, the quantities are prorated accordingly but in no case be less than the column III values. An example for the M2A2 module:

	<u>HFOV</u>	
POPPED HATCH	180	
DRIVER	160	
GUNNER	15	(NOTE: Use true for FOV magnified images.)
COMPOSITE	355	

Therefore the required quantities for this module would be decreased by a factor of 355/360.

For the "vehicle" category: 75 percent are in motion, 50 percent are at their highest level of complexity (i.e., polygon count and dynamics - six DOF for hull and up to three articulated parts), 25 percent are at medium level of complexity and the remaining are at the lowest level of complexity.

For the "immobilized vehicle" category, 35 percent still have articulated components.

7. RETICLES/SYMBOLLOGY/MASKS

Each IG channel provides the capability to display reticles. A reticle is defined to be a 2D graphics display that is overlaid on the 3D OTW or sensor image.

The IG provides the capability to provide channel masks. These masks are used to alter the appearance of the edge of the video, i.e. such as a circular mask.

Refer to Appendix C – CCTT Reticle, Symbolology and Mask Diagrams for Manned Module reticle, symbolology, and mask diagrams.

8. LASER RANGE FINDER

The Laser Range Finder (LRF) simulation provides range information for targets or terrain from 200 meters to the maximum visible range with an accuracy of +/- 3 meters. The LRF computes up to a minimum of eight objects from an eye point. The range finder simulates false/doubled echoes and natural obscurants (i.e., haze, fog, etc.). The effectiveness of the LRF is affected by the use of tactical smoke.

The IG computes the range for the LRF simulation and returns it to the host every other update period. The LRF computation is based on the look direction designated by the host and the intersection of the associated line of sight with visual environment polygons.

9. ANIMATIONS

Where special effects are created using animation sequences, the animation is capable of including up to 256 individual frames. The ability to loop on a selected range of animation frames or to freeze animation frames is provided. The IG supports a minimum of 512 animation sequences.

10. SPECIAL EFFECTS

It is possible to have a minimum of 20 special effects, plus 7 tactical smoke effects, simultaneously active within the viewable area. The average latency to visually represent the special effect does not exceed 86 milliseconds beyond the transport IG delay.

Special effects such as muzzle flashes, missile, fire and smoke effects are example of special effects attached to vehicle models. These special effects are controlled via animation sequences attached to the moving models. In general one special effect is attached for each submodel.

Dynamic motion texture polygons depicted as dust trails are controlled with local polygon switches. Small, medium, and large dust trails for the front and rear are specified. The effect of the dust trail generated by ground vehicles when and only when traversing dry dirt or sand areas is visually simulated. The effects of vehicle type and direction of movement (forward and reverse), variation in transparency, general appearance, and size with the size being based on vehicle speed is included in the dust trail simulation. Five sizes of dust trail are provided; three for forward motion and two for reverse motion with the size being based on vehicle speed.

Similarly, tracers are modeled as light points and local light switches (e.g., headlights, taillights, chemical marking lights and blackout lights) are used to turn on/off single light instances for a vehicle.

10.1 TACTICAL SMOKE

Two types of tactical smoke representations are available in the database, vehicle grenade air burst and artillery ground burst. The tactical smoke effects simulate screening, vision impairment, and single spectrum IR shielding. Each of these tactical smoke models is controlled by the environment manager. The simulator and workstation systems step through a series of successive smoke transparency levels. When the next level of the model is determined to be 100% transparent, it is removed from the scene.

Due to the demanding display processor requirements, CCTT tactical exercises are limited to representing seven simultaneous tactical smoke effect clouds per the simulator or workstation. The tactical smoke are filtered, those nearest to the simulator or workstation are visually represented in the synthetic environment.

Tactical smoke includes the appropriate effects for different delivery systems (e.g., grenade), appearance, dissipation time, growth, size, shape, vision impairment, Infra-Red (IR) shielding, and target silhouetting. For tactical smoke, the temporal effects of growth and dissipation can be predefined. The smoke of the visual and sensor scenes are simulated with different transmittances appropriate to the scene display mode, such as: visible, image intensification, and thermal.

10.2 DETONATIONS

All detonation effects in the database (except tactical smoke) are represented using a single moving model.

10.3 FLARES

The illumination effects of the falling flare model provide an artificial light source for the terrain skin and models. The parameters that effect the size and illumination are controlled by the simulator and workstation specified to the image generator system.

Due to the demanding polygon light intensity calculations, CCTT tactical exercises are limited to representing two simultaneous flare special effects per simulator or workstation.

10.4 WEAPON FIRING EFFECTS

The same weapon firing effects that are available as attached special effects are available as independent weapon firing effects.

10.5 DUST, SMOKE, AND FIRE

The same dust, smoke, and fire effects that are available as attached special effects, are available as independent dust, smoke, and fire effects.

10.6 VEHICLE MARKING SYSTEM

The vehicle marking system is implemented as a table driven texture pattern that consists of chevron markings and alphanumeric characters to symbolically designate the type of vehicle mark. The vehicle marking system supports up to three alphanumeric characters, digits 0-9 and the letters 'E', 'S' and 'X', with or without an underscore.

When three characters are specified, the first character is a prefix mark, the second character is the battalion mark, and the third character is the company mark. Optionally, the first character can be blanked resulting only in the battalion and company being visible. The chevrons that designate the platoon are always oriented away from the alphanumeric characters.

10.7 DISMOUNTED INFANTRY

Dismounted Infantry (DI) moving models are modeled in three stances: standing, kneeling and prone; and 3 motion sequences crawling, walking and running. More realistic looking movement of the DI model is accomplished through cycling through a series of model selects under host control. The model selects represent a different stage for frame of the motion. To represent the position of the DI model the host updates the position of the moving model every frame to ensure proper movement through the environment.

Capability Area: Image Generator

Chap	ICD Paragraph Title	Capability Detail	Testable Attribute	Attribute Test Sequence	Entry Level Test / Drop Back Level					Test Approach			Manual Test Method Available	Test Notes
					1	2	3	4	5	DIS Tool Test	Output/Visual Inspection during exercise	Code and/or Data File Inspection		
7	Update Rate	Support an update rate no less than 15 Hz.	update_rate	4.1	N/A	N/A	N/A	3	N/A		Y			
	Diurnal Effects	Support diurnal effects consistent with those of the CCTT system.	levels_of_illumination	3.1	N/A	N/A	2	N/A	N/A		Y			
			illumination_level	4.2	N/A	N/A	N/A	3	N/A		Y			
			illumination_intensity_and_position	4.3	N/A	N/A	N/A	3	N/A		Y			
	Field of View	Support a field of view in each manned module viewport consistent with the corresponding CCTT manned module viewport field of view.	viewport_field_of_view	4.4	N/A	N/A	N/A	3	N/A		Y			
		Support a viewable area for each manned module consistent with the corresponding CCTT manned module visible area.	manned_module_viewable_area	4.5	N/A	N/A	N/A	3	N/A		Y			
	Levels of Detail	Support a level of detail rendered by the IG at critical visible ranges consistent with that of the CCTT system.	visible_range	3.2	N/A	N/A	2	N/A	N/A		Y			
			terrain_visibility	4.6	N/A	N/A	N/A	3	N/A		Y			
			terrain_facet_visibility	4.7	N/A		N/A	3	N/A		Y			
			landmark_visibility	4.8	N/A	N/A	N/A	3	N/A		Y			
	Target Detection	Support the target detection and recognition requirements for CCTT as described in Appendix A.	target_detection_range	4.9	N/A	N/A	N/A	3	N/A		Y			
			target_recognition_range	4.10	N/A	N/A	N/A	3	N/A		Y			
		Support a Kell factor, ratio of vertical to horizontal resolution in arc-min/OLP, between .8 and 1.2.	kell_factor	4.11	N/A	N/A	N/A	3	N/A		Y			
		Support image motion up to 15 deg/sec without degrading image sharpness by >20%.	image_sharpness	4.12	N/A	N/A	N/A	3	N/A		Y			
		Support a Vernier resolution which does not exceed the requirement of the CCTT system.	vernier_resolution	4.13	N/A	N/A	N/A	3	N/A		Y			
	Thermal Image-Intensification	Support thermal imagery intensification effects consistent with those of the CCTT system.	environmental_conditions	3.3	N/A	N/A	2	N/A	N/A		Y			
			thermal_intensity	3.4	N/A	N/A	2	N/A	N/A		Y			
			thermal_signature	4.14	N/A	N/A	N/A	3	N/A		Y			
			atmospheric_attenuation	4.15	N/A	N/A	N/A	3	N/A		Y			
			thermal_noise	4.16	N/A	N/A	N/A	3	N/A		Y			
			thermal_image	3.5	N/A	N/A	2	N/A	N/A		Y			

Capability Area: Image Generator

Chap	ICD Paragraph Title	Capability Detail	Testable Attribute	Attribute Test Sequence	Entry Level Test / Drop Back Level					Test Approach			Manual Test Method Available	Test Notes
					1	2	3	4	5	Dis Tool Test	Inspection during exercise	Code and/or Data File Inspection		
7	Low-Light Amplification	Support low light amplification effects consistent with those of the CCTT system.	nvg_illumination_levels	3.6	N/A	N/A	2	N/A	N/A		Y			
			light_amplification_effects	3.7	N/A	N/A	2	N/A	N/A		Y			
			blooming_effects	4.17	N/A	N/A	N/A	3	N/A		Y			
			hue_of_light_amplification_device	4.18	N/A	N/A	N/A	3	N/A		Y			
	Database Paging	Support an IG database paging method consistent with that of the CCTT system.	#_static_models1	3.8	N/A	N/A	2	N/A	N/A		Y			
			#_fixed_selectable_models	3.9	N/A	N/A	2	N/A	N/A		Y			
	Moving Models	Support moving model capabilities consistent with those of the CCTT system.	#_moving_models_processed	3.10	N/A	N/A	2	N/A	N/A		Y	Y		
			#_articulated_parts	5.1	N/A	N/A	N/A	3	N/A		Y	Y		
			scene_management_state	3.11	N/A	N/A	2	N/A	N/A		Y	Y		
	Reticles/Symbology /Masks	Support displaying of reticles, symbology, and masks with each IG channel.	reticle_capability	3.12	N/A	N/A	2	N/A	N/A		Y			
	Laser Range Finder	Support LRF capabilities consistent with those of the CCTT system.	#_lrf_returns	4.19	N/A	N/A	N/A	3	N/A		Y			
			lrf_return	3.13	N/A	N/A	2	N/A	N/A		Y			
	Animations	Support animation sequence capabilities consistent with those of the CCTT system.	animation_frames	3.14	N/A	N/A	2	N/A	N/A		Y			
			#_animation_frames	4.20	N/A	N/A	N/A	3	N/A		Y	Y		
			#_animation_sequences	4.21	N/A	N/A	N/A	3	N/A		Y	Y		
	Special Effects	Support special effect capabilities consistent with those of the CCTT system.	special_effects	3.15	N/A	N/A	2	N/A	N/A		Y			
			#_special_effects_active	4.22	N/A	N/A	N/A	3	N/A		Y			
			average_latency	4.23	N/A	N/A	N/A	3	N/A		Y			
			#_special_effects_per_submodel	4.24	N/A	N/A	N/A	3	N/A		Y			
		Support dust trail effects consistent with those of the CCTT system.	dust_trail_control	3.16	N/A	N/A	2	N/A	N/A		Y			
			dust_trail_size	4.25	N/A	N/A	N/A	3	N/A		Y			
			dust_trail_visual	4.26	N/A	N/A	N/A	3	N/A		Y			
		Support the use of tracers is consistent with that of the CCTT system	tracer_visibility	3.17	N/A	N/A	2	N/A	N/A		Y			
		Support the single light instances on vehicles use local light switches.	local_light_switches	4.27	N/A	N/A	N/A	3	N/A		Y			

Capability Area: Image Generator

Chap	ICD Paragraph Title	Capability Detail	Testable Attribute	Attribute Test Sequence	Entry Level Test / Drop Back Level					Test Approach			Manual Test Method Available	Test Notes
					1	2	3	4	5	DIS Tool Test	Output/Visual Inspection during exercise	Code and/or Data File Inspection		
7	Tactical Smoke	Support the tactical smoke effects are consistent with the CCTT tactical smoke effects.	tactical_smoke_types	3.18	N/A	N/A	2	N/A	N/A		Y			
			tactical_smoke_screening_vision_impairment_and_single_spectrum_ir_shielding	4.28	N/A	N/A	N/A	3	N/A		Y			
			tactical_smoke_transparency_steps	4.29	N/A	N/A	N/A	3	N/A		Y			
			tactical_smoke_filter	4.30	N/A	N/A	N/A	3	N/A		Y			
			tactical_smoke_delivery_system_effects	4.31	N/A	N/A	N/A	3	N/A		Y			
			tactical_smoke_transmittance	3.19	N/A	N/A	2	N/A	N/A		Y			
	Flares	Support illumination effects of falling flares consistent with the CCTT falling flare effects.	flare_effects	3.20	N/A	N/A	2	N/A	N/A		Y			
	Weapon Firing Effects	Support weapon firing effects consistent with the CCTT weapon firing effects.	weapon_firing_effects	3.21	N/A	N/A	2	N/A	N/A		Y			
	Dust, Smoke, and Fire	Support dust, smoke and fire effects consistent with those of the CCTT system.	dust_smoke_and_fire_effects	3.22	N/A	N/A	2	N/A	N/A		Y			
	Vehicle Marking System	Support vehicle marking system consistent with the CCTT vehicle marking system.	vehicle_marking_system	3.23	N/A	N/A	2	N/A	N/A		Y			
			three_character_ranking	4.32	N/A	N/A	N/A	3	N/A		Y			
			two_character_ranking	4.33	N/A	N/A	N/A	3	N/A		Y			
			chevron_orientation	4.34	N/A	N/A	N/A	3	N/A		Y			
	Dismounted Infantry	Support capability of modeling DI moving model consistent with the CCTT DI moving model.	di_moving_model_motion	3.24	N/A	N/A	2	N/A	N/A		Y			
			di_moving_model_stance	4.35	N/A	N/A	N/A	3	N/A		Y			
			di_moving_model_update_rate	4.36	N/A	N/A	N/A	3	N/A		Y			

CHAPTER EIGHT – FUTURE CAPABILITIES

The following section describes future capabilities that are envisioned for the CCTT system and addresses the potential impacts that these added capabilities will have on the system.

1. ETHERNET

The CCTT System Network is currently implemented in FDDI. This technology has reached end of life status at most vendors and can no longer be ordered. The CCTT program currently has ongoing studies to implement an Ethernet backbone. The intent is to transition the current architecture with minimal breakage to Fast Ethernet backbone. Some of the issues to be answered are the adaptation of the current multicast configurations to this protocol and determination of which product we will utilize. The testing will be done on a local level in the PDSS with eventual implementation at a full up site. CCTT Fixed Sites must maintain a compatible interface to existing CCTT mobile configurations.

2. HLA/SE CORE

Most simulation based training system today, are based on Distributed Interactive Simulations (DIS) standard. The development of High Level Architecture (HLA) interoperability standard sponsored by DMSO is the next generation simulation standard being adopted by the M&S community. DIS is based on message passing and protocols, whereas HLA supports a distributed object model and a runtime data management referred to as the Run-Time Infrastructure (RTI). RTI offers a set of Management Services (Federation, Object, Ownership, Declaration, Time, and Data Distribution Management) that cooperate to provide a standard framework for HLA based simulations. Simulation Object Models (SOM) are grouped to form federates. Federates communicate using the RTI by creating, deleting and updating objects or their attributes and sending parameters associated with interactions all of which conform to the Federation Object Model (FOM).

3. SEDRIS

PM CATT and industry are striving to develop a common representation of the physical environment. A common representation is the precondition for high levels of interoperability of heterogeneous simulations. SEDRIS is an exchange mechanism in a neutral unambiguous format between the integrated database source data (textures, models, maps and etc) and the runtime application (visuals, maps, sensors etc.)

STRICOM with industry has specified a SEDRIS Transmittal Format (STF) and is generating API's to support application formats currently in use. Plans are in place to complete the SEDRIS database development for CCTT P1, P2, and P3. Other databases will be added as required.

SEDRIS, as a standard method for database interchange, results in fewer data conversions, data losses, and allows common industry tool sets to be shared and reused.

It will enable CCTT and other programs (CATT and non-CATT; AVCATT, UKCATT, SIMNET) lower cost access to additional databases based upon a common data model. The consistent implementation of data will enhance simulation interoperability and broaden the use of heterogeneous simulations.

4. PCIG

The CCTT system today depends on high end graphics signal generators designed for military applications which accounts for approximately one-third of the manned module acquisition cost and contributes significantly to LCCS. Commercial graphics technology today is advancing at a rate faster than “Moore’s Law”. The mass marketed PCIG’s can provide equal or greater performance than CCTT legacy IG’s at less than 60% of the acquisition costs, with significantly less life cycle costs. CCTT is migrating towards a family of low cost PCIG COTS products with an open architecture that will allow “plug and play” transitions.

5. DATABASE ARCHITECTURE

The Enhanced AAR program is currently studying the feasibility of implementing a relational database into the CCTT system. The After Action Review (AAR) Database is being designed to track, sort and store event based information generated during an exercise. This data is used to trigger generation of products such as charts and graphs, which then become part of the resultant AAR.

The database contains data pertaining to the following, as well as other simulation data:

- Units
- Entities
- Overlays
- Radio Nets
- Environment
- Description

Before the exercise is run, the user creates a list of the type of events to record. As the exercise runs, the database collects data on these user-subscribed events, filtering out PDU data not of interest. The resultant data is presented to the user simplifying the AAR creation process.

CHAPTER NINE – P3I ENHANCEMENTS

The following section describes the P3I enhancements that are currently being developed for the CCTT program.

1. FBCB2

The FBCB2 (Force XXI Battle Command Brigade and Below) is an informational system device, which enhances total force effectiveness by providing automated tools to facilitate the battle command process. It augments the ability to operate in an unpredictable and changing environment throughout the battle space, from stability and support operations through war. FBCB2 improves Command and Control (C2) while on the move by receiving and updating the Army Battle Command Systems (ABCS) common battlefield picture/situational awareness via horizontal and vertical linkages between Tactical Operations Center (TOC) mounted platforms. These capabilities reduce the potential occurrence of fratricide. FBCB2 is located in the mounted maneuver (divisional, separate, heavy and light) cavalry/reconnaissance, and armored cavalry, mechanized infantry, infantry and aviation units. It provides the leaders/commanders, shooters, and supporters with software applications capable of selecting, managing, and assimilating relevant data and information. FBCB2 provides tactical users the ability to make and communicate decisions and react with synchronized fires and movement before the enemy can react, thus providing a significant battlefield advantage.

The FBCB2 tactical model consists of a processor unit, a display unit, a keyboard unit, and a cable to connect the CPU to the keyboard unit and the display unit. This unit is militarized to withstand the rigors of military use. The FBCB2 system may also be loaded on commercial computer systems with non-militarized keyboards, displays, processors, and mice. CCTT utilizes one tactical PC in selected FBCB2-equipped manned modules, three commercial off the shelf (COTS) PCs on each FBCB2-equipped AAR and two COTS PCs on each FBCB2-equipped SAF. CCTT synchronizes the date/time on the FBCB2 with the current exercise date/time. CCTT also simulates FBCB2-equipped entities as CGF units. The FBCB2 Processor Units accept interfaces from Ethernet and RS422 serial ports for data transmission of information such as Positional Lightweight GPS Receiver (PLGR) positional data, Turret Position Sensor (TPS) data, Laser Range Finder (LRF) data, and Variable Message Format (VMF) data.

1.1 POSITIONAL LIGHTWEIGHT GPS RECEIVER

PLGR is the standard handheld navigation system for the U.S. Armed Forces and has the following key features:

- Wide Area GPS Enhancement (WAGE) for autonomous positioning accuracy to 4 meters CEP (circular error probable)

- Secure (Y-code) Differential GPS (SDGPS) for positioning accuracy to less than 1 meter CEP
- Jammed direction finding
- Targeting interface with laser range-finding
- Remote display terminal capability
- Advanced user interface features
- Available in both Precise Positioning Service (PPS) and Standard Positioning Service (SPS) versions.²

The FBCB2 units require location data, which is provided by a PLGR or similar device in the real world configurations. PLGR emulation in software provides this location data for CCTT. The location data is retrieved from the CCTT Entity Database and sent to the connected FBCB2 units. It is then formatted to match actual PLGR data to the FBCB2 unit. This location data is also passed to the PLGR Data Interface to support the attached PLGR hardware.

1.2 INTERNET CONTROLLER

The INC (Internet Controller) provides the communications for routing the data on the Tactical Internet (TI). The INC software provides a CCTT capability that is functionally similar to the INCs in the real world Tactical Internet. The CCTT INC provides communications between the FBCB2 units and the simulated TI and is responsible for receiving and routing VMF data between the FBCB2 unit and other FBCB2 units, both real and simulated.

Data from locally hosted FBCB2 units comes to the INC through a local Ethernet UDP connection. The INC then wraps the data in a CCTT specific header and forwards the data to the EPLRS radio simulation. Additionally, CCTT software registers with the INC to handle simulated FBCB2 units (i.e., SAF units receiving or sending VMF with no actual FBCB2 hardware). VMF received from the SAF units are treated essentially the same as messages from the locally resident FBCB2 hardware. For incoming messages, the INC receives the digital data from the radio simulation and checks the address in the CCTT specific header. If any locally hosted or locally simulated FBCB2 unit matches the address parameters, the message is passed on to the locally hosted FBCB2 unit or the CCTT software registered for the simulated FBCB2 unit. Otherwise, the message is discarded. The INC provides TCP/UDP interaction to mimic the actual INC.

For the AAR INC, special functionality is included to prevent FBCB2 messages originating from any of the AAR resident FBCB2 units from transmitting over the CCTT DIS LAN. This supports the AAR monitor only FBCB2 role.

² PLGR Information obtained from Rockwell - Collins Product Information Web site (see references)

1.3 ENHANCED POSITION LOCATION REPORTING SYSTEM

EPLRS is the Army's tactical digital radio and provides a secure, electronic warfare (EW)-resistant tactical transmission system supporting the Army Tactical Command and Control System and the Army Battle Command System. It provides SA and C2 information, and is the Army's primary transmission system for the transmission of near real-time data on the battlefield, including the FBCB2 digital information. CCTT simulates the EPLRS radio. The simulated EPLRS radio is responsible for receiving VMF messages from the INC, wrapping those messages in DIS protocol signal PDUs, and sending transmitter and signal PDUs on the CCTT DIS network. The simulated EPLRS is also responsible for receiving PDUs from the DIS network, filtering based on exercise ID, extracting the VMF message out of the PDU, and passing the VMF data back to the INC. The format for the EPLRS signal PDU is as follows:

1.3.1 EPLRS SIGNAL PDU FORMAT

The actual transmission of digital data to/from simulated EPLRS radios within CCTT for FBCB2 is communicated by issuing a Signal PDU. The Signal PDU has the following format:

Field Size	Signal PDU Fields	
96	PDU Header	Protocol Version – 8 bit enumeration
		Exercise ID – 8 bit unsigned integer
		PDU Type – 8 bit enumeration
		Protocol Family – 8 bit enumerated
		Time Stamp – 32 bit unsigned integer
		Length – 16 bit unsigned integer
		Padding – 16 bit unsigned integer
48	Entity ID	Simulation Address – 32 bit record
		Site – 16 bit unsigned integer
		Application – 16 bit unsigned integer
		Entity Identity - 16 bit unsigned integer
16	Radio ID	16 bit unsigned integer
16	Encoding Scheme	16 bit unsigned enumeration Encoding Class = APPLICATION_SPECIFIC_DATA. Encoding Type = 8-bit mu-law
16	TDL Type	16 bits unsigned unused
32	Sample Rate	32 bit integer
16	Length	16 bit unsigned integer
16	Samples	16 bit unsigned integer
Variable 128 to 528	Digital Message Header	SOURCE PROTOCOL ID – Unsigned 32
		MESSAGE TYPE – Unsigned 16
		MESSAGE SEQUENCE – Unsigned 16
		MESSAGE PDU CNT – Unsigned 8
		MESSAGE PDU SEQUENCE – Unsigned 8

	JVMF FAD – Unsigned 8
	JVMF Msg Number – Unsigned 8
	REPORT/MESSAGE/OVERLAY TYPE – Unsigned 8
	MESSAGE SOURCE URN – 24 bit unsigned integer
	NUMBER_OF_ACTION_URNS - 8 bit unsigned integer
	NUMBER_OF_INFO_URNS - 8 bit unsigned integer
	MESSAGE DESTINATION URN [0] - 24 bit Unsigned
	* Repeated for NUMBER_OF_ACTION_URNS * + NUMBER_OF_INFO_URNS * To a maximum of 16 total destination URNs
	MESSAGE DESTINATION URN [MAX 15] – 24 bit Unsigned
	MESSAGE DESTINATION PADDING – 32 bits

1.3.2 CCTT SPECIFIC VALUES AND DESCRIPTION OF FIELDS

- a. PDU Header = a PDU Header Record is the first part of each PDU.
- b. Protocol Version = DIS PDU version 2.0 - fourth draft (revised) March 16, 1994 = 4.
 - This field specifies the version of the protocol used in a PDU.
- c. Exercise ID = the current exercise number which is 1 – 5 and soon to be 1 – 32.
 - Exercise identification is unique to each exercise being conducted simultaneously on the same communications medium.
- d. PDU Type = Signal = 26.
 - This field indicates the type of PDU that follows.
- e. Protocol Family = Radio Communication = 4.
 - This field indicates the family of protocols to which the PDU belongs.
- f. Time Stamp = the simulation time when the PDU was sent.
 - This field specifies the time, which the data in the PDU is valid.
- g. Length = this field specifies the length of the PDU in octets.
- h. Padding = 0.
 - A 16 bit-padding field.
- i. Entity ID = The ID of the entity that is sending the message.
 - Each entity in a given exercise executing on a DIS application is assigned an entity identifier record unique to the exercise.
- j. Simulation Address = an entity's simulation address is specified by a simulation address record. A simulation address record consists of the Site ID number and the Application ID number.
- k. Site = The CCTT site ID.
 - Each DIS site is assigned a unique Site Identifier

- l. Application = the application number of the system on which the sending entity resides.
 - Each simulation application at a DIS site is assigned an application identifier unique within that site.
- m. Entity Identity = the number assigned, by the application, to the entity sending the message.
 - Each entity in a given DIS application is given an Entity Identity unique to all other entities in that application. This identity is valid for the duration of the exercise; however, entity identity shall be reused when all possible entity identities have been exhausted. No entity shall have an identity of zero, $(2^{16}-1)$ or $(2^{16}-2)$. This number need not be registered or retained for future exercises.
- n. Radio Id = 10 and above. Currently each entity only has one radio whose id is 10. If an entity had more than one radio, the id would be incremented by one for each additional radio.
 - This field identifies a particular radio within a given entity. Radio ID is assigned sequentially to the radios within an entity. The combination of Entity ID and Radio ID uniquely identify a radio within a simulation exercise.
- o. Encoding Scheme = this field specifies the encoding used in the Data field of this PDU. The Encoding Scheme is composed of a 2-bit field specifying the encoding class and a 14-bit field specifying the encoding type:

Bits 14-15	Bits 0-13
Encoding Class	Encoding Type
- p. Encoding Class = Application-Specific Data = 2.
- q. Encoding Type = 8-bit mu-law = 1.
- r. TDL Type = Other = 0.
 - This field specifies the TDL Type as a 16-bit enumeration field when the encoding class is the raw binary, audio, application - specific, or database index representation of a TDL Message. When the data field is not representing a TDL Message, this field is set to zero.
- s. Sample Rate = 0.
 - This field specifies either (1) the sample rate in samples per second if the encoding class is encoded audio or (2) the data rate in bits per second for data transmissions. If the Encoding Class is database index, this field is zero.
- t. SOURCE PROTOCOL ID = 7732 = CCTT_VMF
- u. Message Type – CCTT specific enumeration value. **No longer used – To be eliminated at in future.**
- v. Message Sequence - 16-bit counter incremented with each VMF message sent.
- q. Message PDU Count - 8-bit number of PDUs in a sequence.
- r. Message PDU Sequence - 8-bit number identifying a specific PDU in a sequence.
Example: The following illustrates the values for a message sent using 5 Signal PDUs. This would be the 3245th message sent from this source.

MESSAGE_SEQUENCE	3245	3245	3245	3245	3245
PDU_CNT	5	5	5	5	5
PDU_SEQUENCE	1	2	3	4	5

- s. JVMF FAD – Per TIDP.

- t. JVMF Message Number – Per TIDP.
- u. REPORT/MESSAGE/OVERLAY TYPE – Per TIDP.
- v. Message Source URN – Platform URN of the sending FBCB2.
- w. Number of Action URNs – Number of address URNs listed as Action recipients.
- x. Number of Info URNs - Number of address URNs listed as Info recipients.
- y. Message Destination URN(s) – Variable list of 24 bit URN values for destinations.
Destination URNs are listed in order of Action followed by Info addresses. The total number of destinations is the sum of the “Number of Action URNs” plus the “Number of Info URNs”.

CCTT uses the JVMF parser that is resident within FBCB2 to send/receive messages. CCTT version 8.1 is using FBCB2 version 3.2.4, which contains JVMF parser version 15.6. The parser version determines the JVMF message version the CCTT implements.

1.4 FBCB2 IN MANNED MODULES

Tactical FBCB2 hardware units are mounted in selected CCTT manned modules in a similar manner to the real world mountings. The manned module resident FBCB2 units are connected to the CCTT host processors via an Ethernet connection to provide VMF data communications. All VMF communications to/from the MM resident FBCB2 units occur via the Ethernet connection to the CCTT host resident Internet Controller. PLGR location data is sent to the FBCB2 unit by the CCTT simulated PLGR via an RS-422 serial port connection. Also a physical PLGR device is connected to the CCTT host computer to provide the operator with location and navigation functions. The physical PLGR receives its location data from the CCTT Host via an RS-232/422 serial connection.

1.5 FBCB2 IN SEMI-AUTOMATED FORCES AND TOC WORKSTATIONS

Table 1 lists the FBCB2 message set implemented, along with known corresponding VMF message numbers. The “core message set” is defined as the first twenty-seven messages. Also indicated is whether the message is for “information only” or “further action required” for the simulation purposes. The TRW VMF parser/message generator is existing software, which has been demonstrated, in previous appliques. It is able to code and decode VMF messages and it has been integrated into the CCTT system AIX Distributed Computing Environment (DCE). The VMF parser/message generator source code is provided as Government Furnished Information (GFI).

The SA data for CGF entities is obtained from the entity database. The SAF/TOC workstations generate VMF messages to be distributed to other workstations. Distribution interval is based on time or distance changes. Entity position and health data are extracted from the CCTT entity database rather than scanning PDU traffic directly. SA data is only generated for SAF vehicles tagged as FBCB2 enabled in the currently active exercise. The SAF/TOC workstations receive FBCB2 C2 data and respond, depending on the message sent. Responses include: executing orders, displaying information at the workstation, and/or generating other messages.

The CCTT CGF behaviors simulates C2 FBCB2 functionality as follows:

1.5.1 OBSERVER READINESS REPORT - K02.37

1. The FBCB2-equipped AFATDS vehicle receives an Observer Readiness Report message.
2. The AFATDS vehicle searches its observer record list for an observer record with the sent observer number.
3. If an observer record with the specified number is found, then the position information in that observer record of the AFATDS observer record list is updated or if an observer record with the specified number is not found, an observer record with the received observer number and position is created and inserted into the AFATDS observer record list.

1.5.2 AIRBORNE FIRE MISSION - K02.38

1. CCTT AFATDS receives a Call For Fire Message.
2. AFATDS determines if any field artillery units cannot comply with the requested fire mission.
3. If not, AFATDS determines if an aviation TOC unit is available within the exercise.
4. The target data is transferred from the call for fire message data and an airborne fire mission request is sent out. (For CCTT, a vehicle within the CGF Rotary Wing Aviation (RWA) unit will be assigned the FBCB2 role of the Aviation TOC.)
5. The CGF vehicle assigned the Aviation TOC role will receive the Airborne Fire Mission. The Aviation TOC shall issue the RWA Engage Target Running order.
6. Once created, the RWA Engage Target Running order will be managed by the SAF operator controlling the RWA unit(s) using existing SAF control mechanisms.

1.5.3 ON CALL FIRE COMMAND - K02.12

1. When the CCTT AFATDS receives an On Call Fire Command, it uses the target number from the message to look up the mission in the “On Call” list.
2. If a fire mission with the same target number is not found, an observer notification message set to “End of Mission” is sent back to the observer.
3. If the fire mission exists, the AFATDS will initiate fire mission on the appropriate On Call mission.

1.5.4 OBSERVER READINESS REPORT - K02.37

1. When the observer vehicle halts for a period greater than 60 seconds and is not damaged, an Observer Readiness Report is generated containing the calling vehicle's location, observer number, and the destination URN of the intended recipient.

1.5.5 BRIDGE REPORT - K04.9

1. When a CCTT CGF vehicle creates or removes an AVLB, it generates a Bridge Report

2. When a CGF unit detects a bridge, it determines its location and type. (Vehicular = Ribbon Bridge, No Statement = Prepositioned Bridge). CGF adds the bridge information to its bridge data list. If the bridge type is Vehicular, the CGF unit checks span condition on each span of the bridge, setting Span Condition to the status of the bridge. (Passable, Damaged, Destroyed). The Bridge Report is generated. If the bridge type is No Statement, the CGF unit checks span condition on each span of the bridge, setting Span Condition to the status of the bridge. (Passable, Damaged, Destroyed'). If the span condition is passable, then no further action is required. If span condition is damaged or destroyed, then a Bridge Report is generated (bridge type, bridge location, Span Condition, friendly).
3. If the CGF unit detects a bridge and the bridge condition has not changed, then there is no action. If the bridge condition has changed then the bridge data list is updated and a Bridge Report is generated.
4. If a CGF vehicle receives a Bridge Report and the message is not from a subordinate of the recipient, then no further action is taken. If it is from a subordinate, the vehicle searches to see if this bridge has already been reported. If it has not been reported to this vehicle, CGF will process the bridge info and generate a bridge icon on the PVD. If the described bridge has already been reported, data from the most recent report is put in place of the older data in the bridge list. If the bridge has been reported, but the worst span condition or type has changed, the old bridge icon will be removed and a different icon will be displayed which indicates the new condition and type.

1.5.6 LAND MINEFIELD LAYING REPORT - K05.16

1. Upon the initiation of a minefield create or destroy, the Engineering Unit shall construct a Land Minefield Laying Report and broadcast it to all BLUFOR FBCB2-Equipped vehicles.

1.5.7 LOGISTICS REPORT - K07.3

1. At exercise initialization, the First Logistics Report Time (FLRT), the Logistics Reporting Interval (LRI), and the Logistics Echelon Delay (LED) will be read in from a parameter file. The FLRT must be a 24-hour time, the LED must be at least 1 minute, and the LRI must be greater than 3 times the LED (since 3 echelons are currently supported). The default FLRT is 09:00, the default LED is 5 minutes, and the default LRI is 12 hours. User-specified values will be checked and adjusted into legal range as needed.
2. CGF schedules a one-time appointment at FLRT for First_Generate_Vehicle_Logistics_Report. CGF schedules one-time appointments to First_Generate_Platoon_Logistics_Report and First_Generate_Company_Logistics_Report at FLRT+ LED and FLRT + 2*LED, respectively.
3. First_Generate_Vehicle_Logistics_Report calls Generate_Vehicle_Logistics_Report and schedules appropriate periodic appointments for Generate_Vehicle_Logistics_Report for subsequent logistics reporting cycles
4. Generate_Vehicle_Logistics_Report causes every FBCB2-equipped CGF vehicle to call Update_Vehicle_Logistics to update its Vehicle_Logistics_Record and causes those FBC2-equipped vehicles with FBCB2-equipped subordinates to empty their Unit_Logistics_Record.

5. If the vehicle has no FBCB2-equipped subordinates, then Generate_Vehicle_Logistics_Report causes the vehicle to send a Logistics Report containing its vehicle inventory to the appropriate FBCB2 superior (PSGT, 1SGT, or Bn S3).
6. If the vehicle is an FBCB2 PSGT, then First_Generate_Platoon_Logistics_Report schedules appropriate periodic calls to Generate_Platoon_Logistics_Report and calls Generate_Platoon_Logistics_Report directly. Generate_Platoon_Logistics_Report causes the vehicle to call Add_Logistics_Record to add its vehicle inventory to its unit inventory and sends a Logistics Report containing its unit inventory to its FBCB2 superior (company 1SGT).
7. If the vehicle is an FBCB2 1SGT, then First_Generate_Company_Logistics_Report schedules appropriate periodic calls to Generate_Company_Logistics_Report and calls Generate_Company_Logistics_Report directly. Generate_Company_Logistics_Report causes the vehicle to call Add_Logistics_Record to add its vehicle inventory to its unit inventory and sends a Logistics Report containing its unit inventory to its FBCB2 superior (the company S3).
3. If CGF vehicle receives a Logistics Report message and the receiving vehicle is not the FBCB2 superior of the sender, no further action is taken. If the vehicle is the FBCB2 superior, CGF calls Logistics_Message_to_Record with the received JVMF Logistics Report to store the report data into the unit logistics record.

1.5.8 OBSERVER MISSION UPDATE - K02.6

1. If the CGF observer vehicle receives an Observer Mission Update via FBCB2 the target number supplied in the message is used to determine whether the unit was the fire mission's originator. If the unit was the originator, the observer notification value is checked. If the value is 'Shot', then the Mission_In_Progress variable is set to true for the appropriate fire mission. If the value is 'Cannot Comply', or 'End of Mission', an End of Mission & Surveillance Message is sent to the CCTT AFATDS.

1.5.9 OBSTACLE REPORT - K04.3

1. A CGF aggregate unit initially detects an obstacle and adds it to the BLUFOR obstacle persistence list. CGF sets Obstacle_Type to the type of obstacle spotted, Obstacle_Control_Designator to the Force Id of the obstacle, Impact_On_Movement to "Block.", Obstacle_Location to the location of the obstacle, and Observation_Time to the simulation time when the obstacle was spotted. The Bypass_Location and Safe_Corridor are defaulted to be the observing unit's location. CGF schedules a Callback to Generate an Obstacle Report with Obstacle_Type, Obstacle_Control_Designator, Impact_On_Movement, Obstacle_Location, Observation_Time, Safe_Corridor, and Bypass_Location as inputs to be executed in five minutes from the current simulation time. A window is popped up on the SAF WS which describes obstacle type, location, and detecting unit. The window has fields to permit entry of safe corridor point(s) and bypass location(s). If the SAF operator inputs bypass corridors or safe locations and chooses OK on the popup window. The Callback to Generate_Obstacle_Report is destroyed. CGF overwrites the defaulted Bypass_Location, Safe_Corridor locations with any valid location information input by the SAF operator in the popup window. It then generates an Obstacle Report

2. If the SAF Operator chooses cancel, or does not respond within 5 minutes, the CGF generates an Obstacle_Report via the callback with the Obstacle Report information it receives

1.5.10 PERSONNEL STATUS - K07.04

1. During initialization, the Personnel Status capability will register to be notified of all vehicle creation events and the following Personnel Status send events: after enemy engagements and standard logistics message send times.
2. When notified of a vehicle create, the Personnel Status capability will create a default crew for the vehicle.
3. When notified of a Personnel Status send event, the Personnel Status capability will query the Entity Database to determine the status of each vehicle with a defined crew, perform crew damage assessment based on the vehicle status, construct the Personnel Status VMF message, and send the message on the local support multicast group (MCG).
4. Each support MCG position server is responsible for receiving and accumulating Personnel Status messages from the peer support MCG. When the crew for a vehicle in the peer support MCG is killed, the position server will determine the crew status directly and include the report in the accumulated Personnel Status reports.
5. After the Personnel Status reports from all peer Support MCG members are received, the position server will send the accumulated Personnel Status report to the higher echelon support MCG. This rollup processing will be terminated at the battalion level since CCTT does not support brigade and above.
6. For Personnel Status generation: When the simulation time reaches or passes the personnel status start reporting time or at the end of each personnel status interval determined by CCTT, a Personnel Status message is created. When an FBCB2_superior receives all its subordinates' messages, the information is accumulated for each subordinate and a Personnel Status message is generated.
7. When a Personnel Status Report Message is received, the data is stored. The subordinate list is examined to see who should be sending a Personnel Status report to this superior. If the FBCB2_superior has received all its messages, a Personnel Status report is created. If the FBCB2_superior has not received all its messages, then the physical status of each vehicle from which a Personnel Status report has not been received is examined. If the number of K-Killed subordinates plus the number of messages received is equal to the number of expected messages, then a Personnel Status report is generated

1.5.11 SITUATION REPORT - K05.14

1. The FBCB2-equipped CGF vehicle receives a situation report. If the report is not from a subordinate vehicle, no further action is taken. If the report is from a subordinate unit, then the Unit Material Status Code (UMSC) fields are examined for fuel and for each munition record included in the report. If all UMSC material codes are 'Green', then no further action is taken. If not all UMSC material codes are 'Green', the unit obtains the destination URN of its superior unit. If the unit has no superior unit, the URN of the BN SPT MCG is used.
2. The unit forwards an identical copy of the received report to its superior unit (or BN SPT MCG).

1.5.12 SPOT/SALUTE REPORT - K04.1

1. The unit receives a Spot/Salute Report message. If an FBCB2 spot report symbol is displayed within 100 meters of the spot report location, the message is ignored.
2. Symbology for the reported vehicle(s) and location(s) will be displayed on the SAF WS PVD. This icon will be added to the list of active icons for the SAF WS.
3. If the reported vehicle in the Spot/salute report is OPFOR aircraft, then a callback function will be scheduled for 2 minutes from the time of message receipt. This callback function will remove the icon from the PVD. The interval 2 minutes was selected to correspond to the FBCB2's default time for fading an 'Air' icon to the 'Old' level.
4. If the reported vehicle is an OPFOR ground vehicle, a callback function will be scheduled for 40 minutes from the time of message receipt. This callback function will remove the icon from the PVD. The interval 40 minutes was selected to correspond to the FBCB2's default time for fading an Enemy icon to the 'Old' level.

Note: FBCB2 icons for Enemy are purged by default at 12 hours. FBCB2 icons for Air are purged by default at 2.5 minutes. No 'fading' capability can be added to existing PVD code, since no space for the needed data exists in the current PVD icon structure and these structures are stored in many pre-existing scenarios.

1.5.13 STRIKE WARNING MESSAGE K05.11

1. CGF processes a BLUFOR TACP CAS Mission strike warning message order.
2. The mission status and ammunition levels are checked to determine mission start time.
3. The ammunition type, altitude, and distance to target are examined to determine a minimum safe distance.
4. An operator report is generated indicating the perform mission order has been received and accepted.
5. The mission start time, estimated time of arrival, one-way time to contact point, and sets mission status are determined.
6. Once the mission begins, the Strike Warning message is generated.
7. Cgu_fbc2_utilities.Generate_Strike_Warning_Message will assign the following data to the fields in order to generate the message:
 - Current_Physical_Status.Platform.Weapon_List to Warning_Indicator
 - Unit_Id.Time_To_Start_Mission to Strike_Group.
 - "CCTT" to Warning_Codeword
 - "" to Fire_Plan_Name
 - Target_Overlay_Handle to Target_Number
 - Assign to the MSD_Groups (1,2,3) a maximum of 20 Minimum_Safe_Distance, and Ground_Zero_Location.
 - "1" to the No_Multiple_Strikes
 - "1" to the No_Surface_Bursts
8. When an FBCB2-equipped CGF unit receives a Strike Warning and the unit has a superior unit, the message is ignored. Otherwise, an icon corresponding to the strike type (Conventional or Nuclear) and location(s) will be displayed on the SAF WS PVD. This icon will be added to the list of active icons for the SAF WS.

9. A callback function will be scheduled for 90 minutes from the Strike Time reported in the received message. This callback function will remove the icon from the PVD. The interval 90 minutes was selected to correspond to the FBCB2's default time for fading a Friendly icon to the 'Old' level. FBCB2 icons for Friendly are purged by default at 8 hours. No 'fading' capability can be added to existing PVD code, since no space for the needed data exists in the current PVD icon structure and these structures are stored in many pre-existing scenarios.

1.5.14 THREAT WARNING - K05.13

1. When an FBCB2-equipped CGF unit receives a Threat Warning and the unit has a superior unit, or if the threat is hostile air and the targets described correspond to targets already in the unit's sensor list, the message is ignored. Otherwise, an icon corresponding to the threat type and location will be displayed on the SAF WS PVD. This icon will be added to the list of active icons for the SAF WS.
2. A callback function will be scheduled for 40 minutes from the time of message receipt. This callback function will remove the icon from the PVD. The interval 40 minutes was selected to correspond to the FBCB2's default time for fading an Enemy icon to the 'Old' level. FBCB2 icons for Enemy are purged by default at 12 hours. No 'fading' capability can be added to existing PVD code, since no space for the needed data exists in the current PVD icon structure and these structures are stored in many pre-existing scenarios.
3. If the receiver is a CGF support vehicle and the reported threat type is an aircraft whose reported location within 3000 meters of the vehicle's location, then the receiving vehicle's unit will enter a Situational Interrupt.
4. If a CGF Company receives a spot report from one of its subordinates, then CGF checks loops all of the vehicles listed in that spot report:
 - If a vehicle is an aircraft (either fixed or rotary) that has been detected and was not already in the company's sensor list, then CGF increments the variable Number_Threats_Spotted.
 - If Number_Threats_Spotted is 1, then CGF sets First_Spotted_Entity_Id to the entity id of this vehicle, otherwise
 - If a vehicle is an aircraft (either fixed or rotary) that was previously detected and is now at a Sighting_Kind of "No_Sighting". CGF increments the variable Number_Threats_Cancelled. If Number_Threats_Cancelled is 1 then CGF sets First_Cancelled_Entity_Id to the entity id of this vehicle.
5. After all targets in the spot list have been looped through, if the Number_Threats_Spotted is greater than 0, then CGF generates a Threat Warning with Number_Threats_Spotted (Strength), "No_Statement" (Threat_Posture), First_Spotted_Entity_Id, and Company_Handle.
6. If Number_Threats_Cancelled is greater than 0, then CGF generates a Threat_Warning message with Number_Threats_Cancelled (Strength), "Cancelled" (Threat_Posture), First_Cancelled_Entity_Id, and Company_Handle

1.5.15 CALL FOR FIRE – K02.04

1. The CCTT artillery platoon receives a grid call for fire request generated by an FBCB2 equipped observer.

2. The simulated FBCB2 acknowledges the message, if requested, and sends it the simulated AFATDS
3. The AFATDS simulation processes the call for fire, whether it is an adjust fire or fire for effect mission.
4. The AFATDS simulation issues a Message to Observer message via its simulated FBCB2 to the observer.
5. The AFATDS simulation fires the mission, making munition and other adjustments it deems necessary.
6. The fire mission stays on the active target list until an End of Mission is received from the observer, or a repeat FFE or adjust fire mission is requested.

NOTE: Only M109A5 and M109A6 howitzers with their associated FAASVs are simulated.

Only grid fire requests are simulated

7. For CGF generated CFFs, CGF checks unit sensor list for targets. It determines target location and distance to the enemy using the entity id of the closest enemy in the unit sensor list. The Method of Attack is set to “Destruct”.
8. CGF checks for obstacles to be in the encountered and determines obstacle location by examining the encountered list. It sets the FFE projectile to “Wp” and Method of Attack to “On_Call”
9. CGF checks to see if the unit has an Assault order in the Set Order. It calls Find Center of Area with the objective overlay symbol to determine the center of the objective and the assault position. It assigns Method of Attack to “On_Call”
10. CGF checks to see if the unit is assigned a Defend order in the Set Order. If so, it calls Find Center of Area with the engagement area overlay symbol to determine the center of the engagement area. It assigns Method of Attack to “On_Call”. Then it uses the X and Y values of the location to convert to lat and long to set the values of target latitude and longitude. The Z of the location is used to set the value of target elevation. It converts the target kind type to the Enemy Information and sub info types using the conversions in VMF Parser. The Method of Fire is set to “Adjust_Fire”, the Method of Control is set to “Adjust_Fire”, a Target Number is assigned, using the target number list. An Observer Number is assigned using the observer number list. CGF determines if the minimum distance threshold has been reached.
11. CGF generates a Call For Fire with target number, observer number, target latitude, target longitude, target elevation, target type, target subtype, method of fire, method of control, method of attack, FFE projectile, receiver urn, and its own URN. The Target Length, Width, Attitude, and Radius are set to 0. The Fire Mission Message is set to “Grid_Fr”. The Fire Mission Priority is set to “Normal”.
12. The CFF is sent out.
13. CGF waits for End Of Mission message before reevaluating enemy situation (spot list is not zero) to determine if a new VMF Call For Fire message should be generated.

1.5.16 SUBSEQUENT ADJUST – K02.22

1. The CGF observer who generated the active CFF request determines that a subsequent adjust mission is necessary. He generates a valid subsequent adjust mission via his simulated FBCB2

2. The INC associated with the CGF observer FBCB2 wraps the VMF subsequent adjust in a DIS signal PDU and sends it across the CCTT DIS LAN
3. The INC associated with the FABTOC simulated FBCB2 intercepts this PDU, strips out the VMF subsequent adjust and sends it to the addressed FABTOC simulated FBCB2
4. The simulated FABTOC FBCB2 sends back VMF message acknowledgment, if requested
5. The FBCB2 simulation examines the subsequent adjust mission request, translates the VMF to AFATDS, and hands the request to the AFATDS simulation
6. The AFATDS simulation issues a Message to Observer message via its simulated FBCB2 to the observer
7. The simulated AFATDS processes the request, populates a fire order, and sends it to the appropriate CGF via the SEOD
8. The commanded artillery CGF receives the SEOD order and performs the fire mission.

1.5.17 CHECK FIRE – K02.01

1. The CCTT artillery platoon receives a Check Fire request generated by the observer's FBCB2 via the simulated FBCB2.
 2. The simulated FBCB2 returns a VMF message acknowledgment, if requested, and passes the request to the simulated AFATDS.
 3. The simulated AFATDS halts the mission.
-
1. For CCTT CGF generated CFs, if the CGF unit had generated a Call for Fire message and is receiving incoming artillery fire, then the CGF retrieves the force side of the artillery from the detonation pdu.
 2. It calculates the distance between the unit and the detonation. If the distance is less than or equal to 600 meters and the force side is Blufor then the CGF compiles the parameters for the Check Fire message, or the CGF unit had generated a Call for Fire message and the enemy is no longer present, then the CGF retrieves the target location from the previous Call for Fire message. It then calls the function Enemy in Area with the target location and the distance set to 500 meters. If it returns that live enemy is not in the area then the CGF compiles the parameters for the Check Fire message. The target and observer numbers are set to the values from the Call for Fire message. The unit generates a Check Fire message with the target number and observer number. Check Fire/Cancel Check Fire is set to "Check Fire Order". Check Fire Message Designator is set to "Command Check Fire" and the Check Fire message is sent out.

1.5.18 ON CALL FIRE COMMAND - K02.12

1. For CCTT CGF generated Call for Fire messages set to "on call", when the unit detects enemy units while reacting to an obstacle, or the unit detects enemy units while executing a defend order, CGF calls Enemy in Area with the engagement area to determine if enemy units are in the engagement area. If the unit detects enemy units while executing an assault order, then CGF calls Enemy in Area with the assault position and the objective to determine if enemy units are in one of the areas.
2. CGF searches the unit's list of on call Call for Fire messages to find the message with the same target location as the obstacle.

3. The target number and observer number are retrieved from the previous Call for Fire message.
4. CGF generates an On Call Fire with the target and observer numbers. The Fire Command Message Designator is set to “Fire”.

1.5.19 END OF MISSION - K02.16

When an Observer Notification message is received with the observer notification field set to “rounds complete”, the observer will generate an End of Mission message to the firing unit. After a Check Fire order is sent, then an End of Mission message is sent to clear the previously received Call for Fire and Check Fire orders.

Table 3 VMF Messages

	VMF MSG#	VMF MSG NAME	VMF Parser Vers. 15.6	Supported by Tactical FBCB2 Vers. 3.2.4	Supported by CCTT 8.0 Simulated FBCB2
1	K01.1	Free Text	√	√	
2	K01.2	Unit Reference Query/ Response	√	√	√
3	K02.01	Check Fire	√	√	√
4	K02.04	Call for Fire	√	√	√
5	K02.06	Observer Mission Update	√	√	√
6	K02.15	Fire Support Coordination Measures	√	√	
7	K02.16	End of Mission & Surveillance	√	√	√
8	K02.22	Subsequent Adjust	√	√	√
9	K02.27	Close Air Support Request	√	√	
10	K04.1	Spot/Salute Report	√	√	√
11	K04.2	Land Route Report	√	√	
12	K04.3	Obstacle Report	√	√	√
13	K04.9	Bridge Report	√	√	√
14	K05.01	Position Report/ Update	√	√	√
15	K05.02	NBC1	√	√	
16	K05.04	NBC3	√	√	
17	K05.05	NBC4	√	√	
18	K05.12	REDCON/ MOPP	√	√	
19	K05.13	Threat Warning	√	√	√
20	K05.14	Situation Report	√	√	√
21	K05.15	Field Orders	√	√	
22	K05.16	Land Minefield Laying Report	√	√	√
23	K05.17	Overlay Message	√	√	
24	K07.1	MEDEVAC Request	√	√	
25	K07.3	Logistics Report	√	√	√

	VMF MSG#	VMF MSG NAME	VMF Parser Vers. 15.6	Supported by Tactical FBCB2 Vers. 3.2.4	Supported by CCTT 8.0 Simulated FBCB2
26	K07.4	Personnel Status	√	√	√
27	K07.N3	Supply Point Status Report	√	√	
28	K01.3	Information Request Message	√	√	
29	K01.N1	Network Monitoring Message	√	√	
30	K01.N2	System Coordination Message	√	√	
31	K02.02	Registration Data	√	√	
32	K02.03	Fire Support Meteorological Data	√	√	
33	K02.05	Shell Report	√	√	
34	K02.07	Survey Control Point	√	√	
35	K02.08	Schedule of Fires	√	√	
36	K02.09	Target Data	√	√	
37	K02.10	Fire Plan Mission/Fire Plan Cancellation	√	√	
38	K02.11	Ammunition Inventory	√	√	
39	K02.12	On-Call Fire Command	√	√	√
40	K02.13	Mission Clearance	√	√	
41	K02.14	Message to Observer	√	√	√
42	K02.17	Mission Summary - Indirect Fire/CAS Missions	√	√	
43	K02.18	Fire Unit Status	√	√	
44	K02.19	Target Query/ Standing Request for Information	√	√	
45	K02.20	Survey Control Point Information Request	√	√	

	VMF MSG#	VMF MSG NAME	VMF Parser Vers. 15.6	Supported by Tactical FBCB2 Vers. 3.2.4	Supported by CCTT 8.0 Simulated FBCB2
46	K02.23	Fire Plan Orders	√	√	√
47	K02.24	In Progress Mission Notification	√	√	
48	K02.25	End of Mission Notification	√	√	
49	K02.31	Mission Request Rejection	√	√	
50	K02.32	Close Air Support Request Acceptance	√	√	
51	K02.33	Close Air Support Aircrew Briefing	√	√	
52	K02.34	Aircraft On-Station	√	√	
53	K02.35	Aircraft Depart Initial Point	√	√	
54	K02.36	Aircraft Mission Update	√	√	
55	K02.37	Observer Readiness Report	√	√	√
56	K02.38	Airborne Fire Mission	√	√	√
58	K03.01	Basic Weather Report	√	√	
59	K03.02	Initial Airborne Artillery Fire Control Radar (FCR) Engagement Report	√	√	
60	K03.03	Forecast Meteorological Data	√	√	
61	K03.04	Fallout Meteorological Data	√	√	
62	K03.05	Observed Weather Data	√	√	
63	K08.1	Pre-positioned Supply Report	√	√	
64	K04.99	Observed Position Report	√	√	

	VMF MSG#	VMF MSG NAME	VMF Parser Vers. 15.6	Supported by Tactical FBCB2 Vers. 3.2.4	Supported by CCTT 8.0 Simulated FBCB2
65	K04.4	Airborne Artillery Fire Control Radar (FCR) Report	√	√	
66	K05.03	NBC2	√	√	
67	K05.06	NBC5	√	√	
68	K05.07	NBC6	√	√	
69	K05.08	Basic Wind Report	√	√	
70	K05.09	Chemical Downwind Report	√	√	
71	K05.10	Effective Downwind Report	√	√	
72	K05.11	Strike Warning	√	√	√
73	K05.N1	Geographical Reference Data	√	√	
75	K07.2	Casualty Report	√	√	
76	K07.5	EPW/ Detainee Evacuation Request/ Response	√	√	
77	K07.6	CTIL/BRIL Action Message	√	√	
78	K07.N4	Task Management (CFS)	√	√	
79	K0M.XX	Security Message	√	√	
80	K02.21	Request for Clearance to Fire	√	√	

Capability Area: FBCB2

ICD Paragraph Title	Capability Area	Capability Detail	Testable Attribute	Attribute Test Sequence	Entry Level Test / Drop Back Level					Test Approach			Manual Test Method Available	Test Notes
					1	2	3	4	5	DIS Tool Test	Output/Visual Inspection during exercise	Code and/or Data File Inspection		
Positional Lightweight GPS Receiver	Infrastructure	Support ability to send location data from module to its FBCB2	FBCB2_Receive_Loc_Data	1.1		1				Y				
Enhanced Position Location Reporting System	Infrastructure	Support the ability to receive VMF messages in a Signal PDU format from a DIS LAN	FBCB2_Receive_VMF_PDU	1.2		1				Y				
	Infrastructure	Support the ability to send VMF messages in Signal PDU format on a DIS LAN	FBCB2_Send_VMF_PDU	1.3		1				Y				
	Synthetic Environment	Simulation application shall synchronize its FBCB2 with current simulation time	FBCB2_Time_Synchronization	1.4		1				Y				

2. ODS

The ODS modifications consisted of 3 pieces:

- 1) PLGR Precision Lightweight Global Positioning Receiver
- 2) LRF Laser Range Finder
- 3) DCS Digital Compass System

The PLGR adds GPS capability between the user and the system. Tactical H/W is used along with an LMIS S/W simulation that drives the various PLGR displays. I believe the PLGR is also integrated with the FBCB2 simulation S/W.

H/W in the loop:

- PLGR (tactical)
- RS-232 (to the PLGR)

The LRF capability was added to the system. You can laze on a target and the system responds with a range to the target. The Ballistic computer was updated to use the LRF range to automatically control gun elevation to the target. Prior to LRF on the M2, the ballistic computer got its range from a rotary knob. As in the real M2, this capability was added as an override to the LRF computed range.

H/W in the loop:

- PIE (LRF switches on gunner's and commander's handles)
- ESIG (for the reticle)
- Ethernet (to/from the ESIG)

The DCS capability added both the drivers and commanders tactical display H/W to the system. The displays for both were emulated based on the ICD's from KVH (compass vendor). Due to deficiencies in the KVH ICD, we never implemented Declination (calibration to account for differences in True and Magnetic North). CCTT always displays True without error. Calibration screens of the Compass system were not implemented (no value added to CCTT type training).

H/W in the loop:

- Commander's Display
- Driver's Display
- RS-232 (to the displays)

3. SEP

Reason for Effort:

PM Abrams has determined that upgrades to the current M1A2 baseline are required in order to provide a more effective weapon system in support of the US Army Task Force XXI initiative. Specific enhancements include the addition of a second-generation FLIR capability to replace the thermal viewer, a new commander's display, and C3I enhancements.

Description of Effort:

The design of these M1A2 SEP Simulators will be the CCTT M1A2 baseline modified as follows:

NEW CAPABILITY	TYPE	FIDELITY	
		PHYSICAL	FUNCTIONAL
Commander's Display Unit (CDU)	HW	Medium	Medium
M1A2 SEP SMI	SW	n/a	Medium
Gen II CITV	Both	Medium	Medium
Commander's Control Handle	HW	High	Medium
Commander's Keyboard	HW	Low	Medium
POSNAV	SW	n/a	High
GPS Gen II FLIR	Both	n/a	Low
Thermal Receiver Unit (TRU)	HW	Medium	Medium
Thermal Imaging System (TIS)	HW	Medium	Medium
Gunner's Biocular Display	HW	Medium	Medium
IG Upgrades	Both	Medium	Medium
Under Armor Auxiliary Power Unit	SW	n/a	Medium
Voice Synthesis	Both	n/a	Medium
Simultaneous CITV and CPH	SW	n/a	High
MPAT	SW	n/a	Medium.
EBC/FBCB2 Interoperability	SW	n/a	Medium

System Interface:**Software:**

The CCTT SEP design used the "Interface Control Document For The Abrams Common Software Library (ACSL) Version 2.5r1" document as the guide for upgrading the M1A2 baseline code for this variant type.

Visual:

The SEP upgrade added a third channel to the ESIG design of the M1A2. There were changes to the E&S visual ICD as a result of the extended reticles required by this project.

4. BCIS

4.1 THE BCIS INTERROGATION PROCESS.

The figure 1.a below depicts the functional scenario for the BCIS capability as it is implemented in the CCTT system.

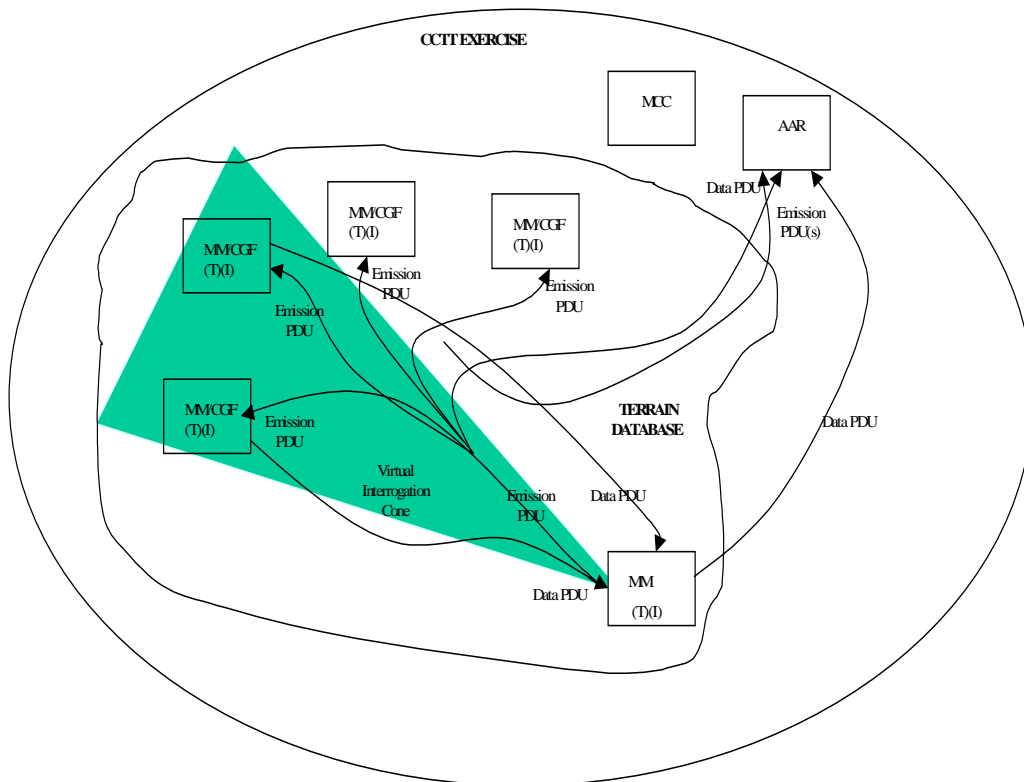


Figure 1a. Functional BCIS Interrogation Scenario in the CCTT System

The BCIS Interrogation is functionally implemented by the exchange of Emission and Data PDUs between the Interrogator (the source) and the responders (targets) in a CCTT exercise. The BCIS Interrogation would begin by an Emission PDU being sent by the Interrogator as a DIS broadcast. All entities in the exercise will receive the Emission PDU. The Emission PDU will contain the coordinates and parametric data (such as antenna orientation) which depicts the virtual cone for the emission. All receivers of the Emission PDU will proceed to compute their response based on whether they lie within the interrogation cone (SECTOR) or not. The computation will be done by the receiving transponder solely based on its location relative to the emitter beam and the pair-wise Line of Sight (LOS) intervisibility between the local transponder and the source interrogator. If the LOS intervisibility value is acceptable, the local transponder will send an affirmative response indicating it is in the interrogation sector and should be taken into account in the BCIS Probability of Correct Identification (PCI) calculation. If the intervisibility factor is not acceptable, due to no line of sight then no response will be sent by the local transponder. The Interrogator will receive responses from all transponders inside the interrogation sector that have acceptable LOS. The interrogator proceeds to compute the PCI for the Transponder of interest using the BISEPS PCI model as obtained from GATECH. (See reference BCIS Study). The interrogator will send report data to the AAR containing the results of the interrogation.

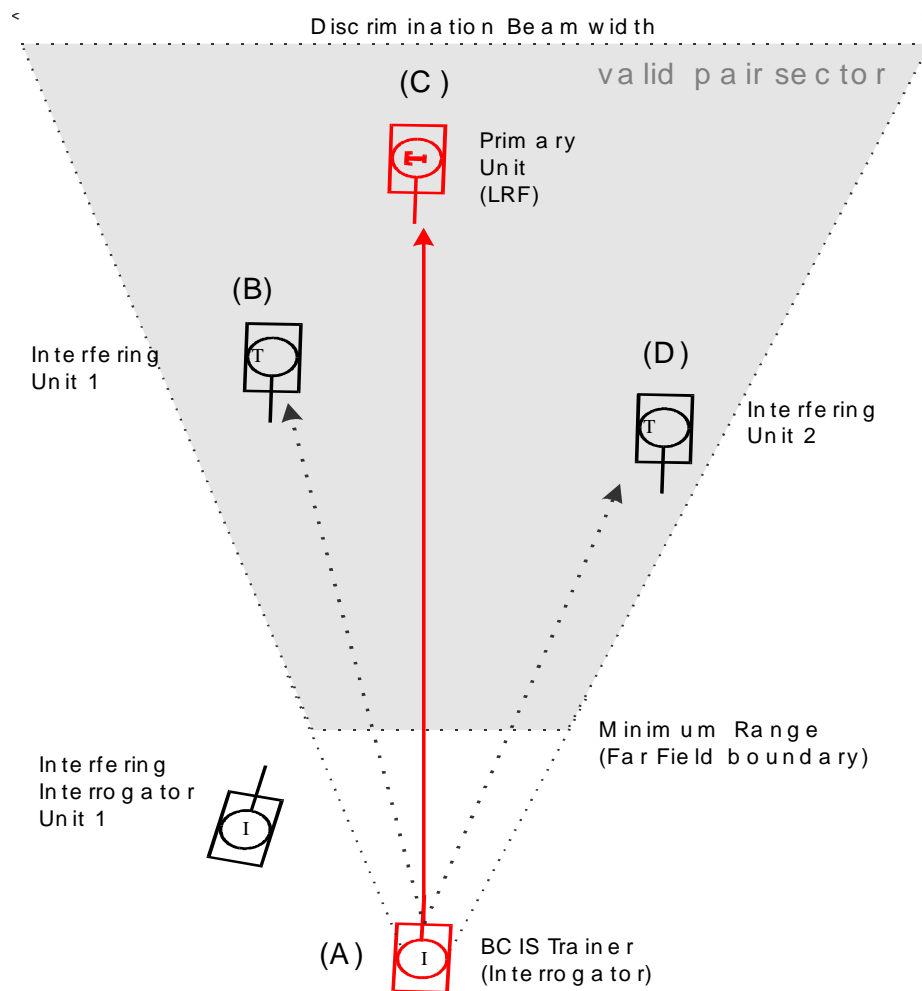


Figure 1b. Typical BCIS Interrogation Engagement with Interferos

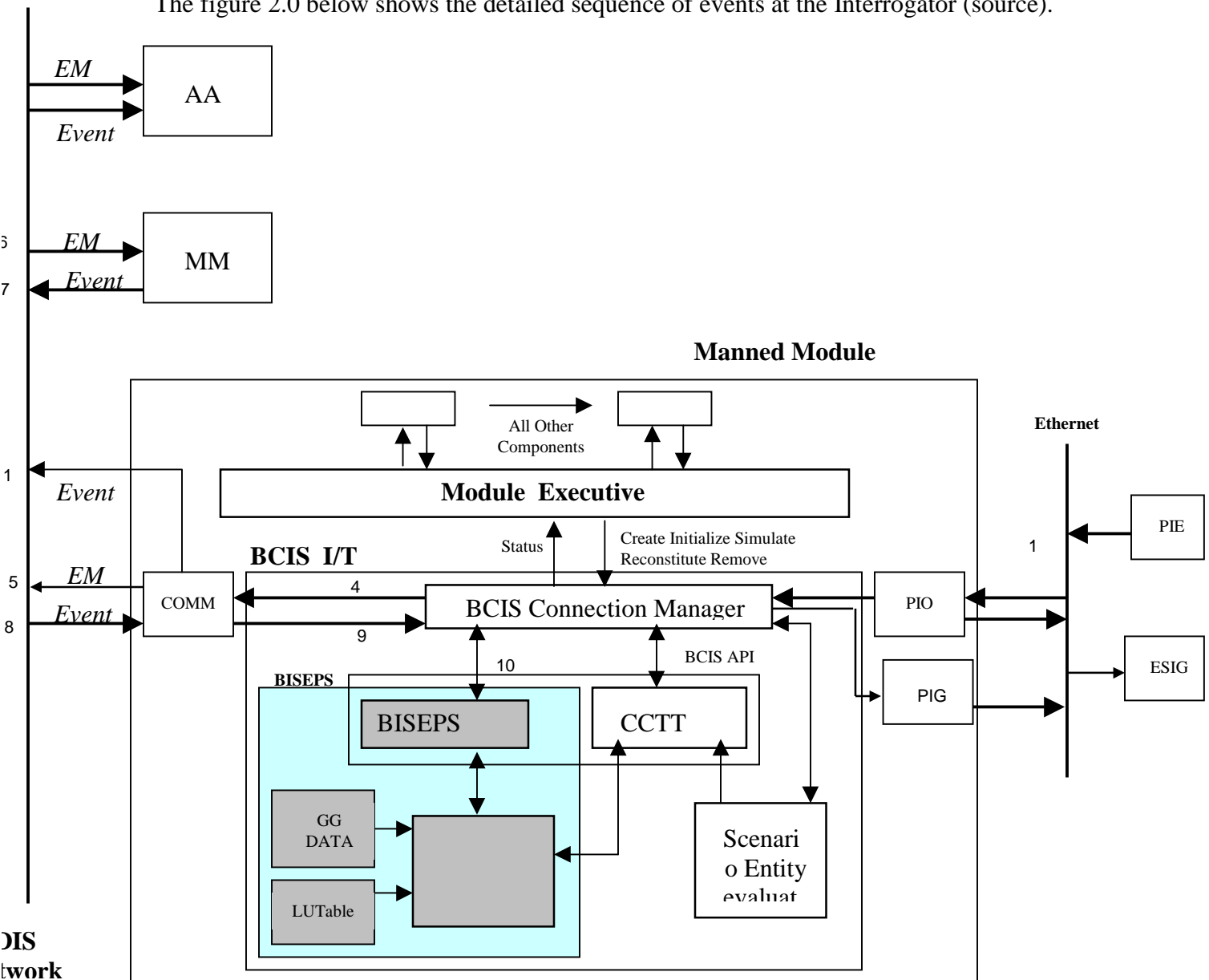
The figure 1b above shows the typical BCIS engagement scenario. The BCIS Interrogation targets the identification of a given entity or primary unit (transponder equipped – FRIEND) which has been acquired by the interrogator LRF establishing a range. In this scenario a set of responses will be obtained by the Interrogator from all units in the valid pair sector (Interrogation Sector). Units B and D will respond to the interrogator while unit C is the target of the interrogation, although with lower probability than the primary unit C. The probabilities of the primary unit and interferer (off boresight) units responding to the interrogator under this typical scenario is given by the table below:

VISABILITY	RANGE		FRIEND ID PROBABILITY -PCI		
	Minimum	Maximum	At bore sight	±27.5 mils	± 35 mils
Clear	150m	5500m	0.95	≤ 0.10	≤ 0.01
4mm/hr Rain	150m	3000m	0.95	≤ 0.10	≤ 0.01
Radiation Fog	150m	4000m	0.95	≤ 0.10	≤ 0.01

The table shows the primary unit being interrogated – unit C at boresight has a 0.95 probability of being identified as a FRIEND, while units B and D – off boresight have a much lower probability. NOTE: although only two off – boresight columns with azimuth values of +27.5 mils and +35 mils are shown the roll-off or decay of the PCI is a continuous somewhat monotonic function of azimuth.

4.2 INTERROGATOR FUNCTIONAL SEQUENCE

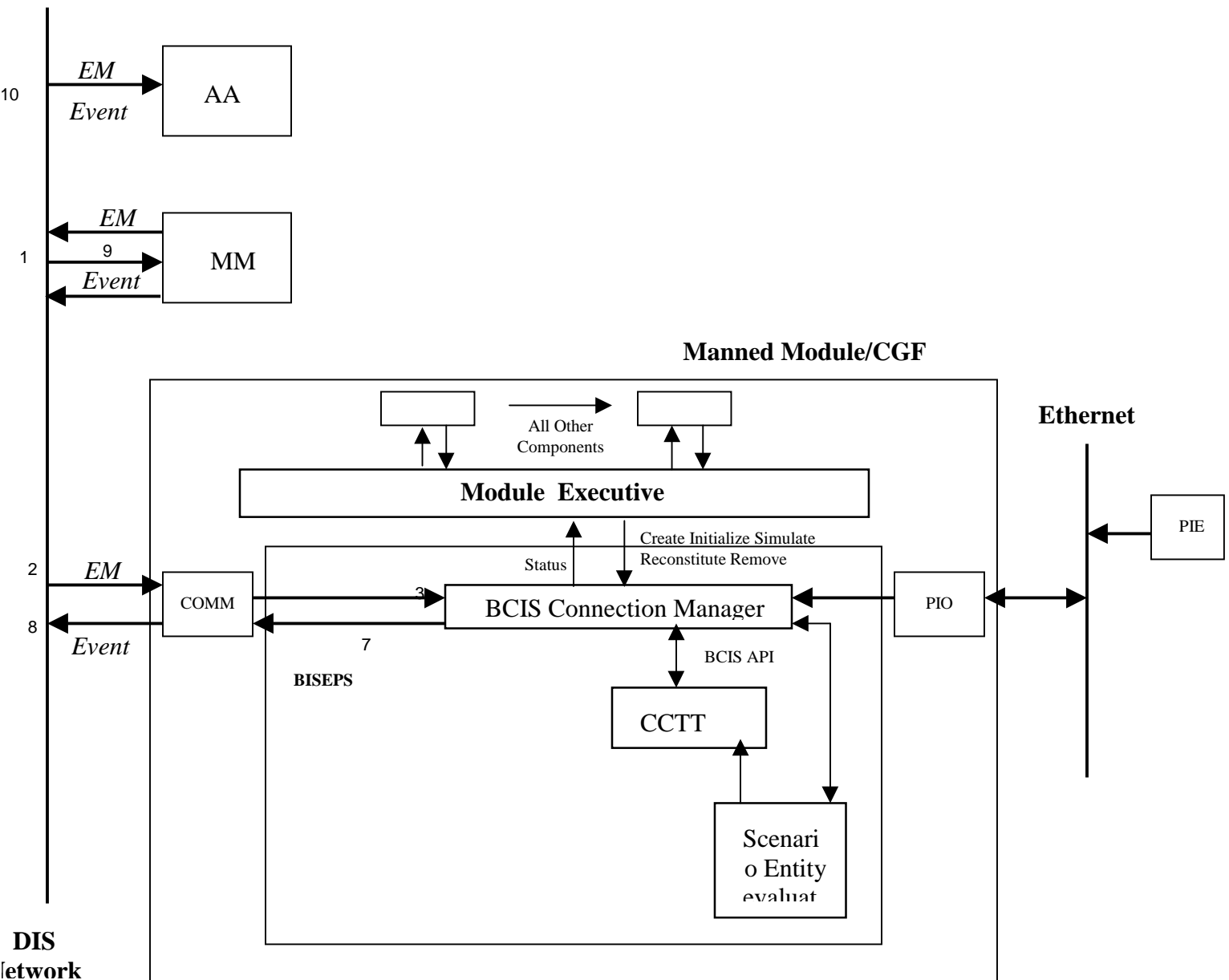
The figure 2.0 below shows the detailed sequence of events at the Interrogator (source).



- 3** The CCTT API is used to access other CCTT subsystems for terrain location information.
- 4** The Emission cone data and antenna parameters are packaged in an Emission PDU.
- 5** The Emission PDU is sent as a DIS Network Broadcast
- 6** The Emission PDU arrives at the target(s).
- 7** The target sends the Event Report PDU response after computing the interrogation sector and confirming it is within the emitter beam. If not within the beam no response is sent.
- 8** The Event Report PDU (response) arrives at the Interrogator (source).
- (8a)** Event Report PDU arrives at the AAR. All responses are tracked and logged.
- 9** The Event Report response data is extracted.
- 10** The Interrogator uses the response data to compute the PCI for all entities that responded.
- 11** The interrogator sends an Event Report PDU to the AAR containing the results of the BCIS interrogation.
- 12** The AAR receives the Event Report PDU containing the BCIS report data.
- 13** The BCIS symbol is displayed on the visual subsystem.
- 14** The BCIS audio is played on the Intercom.

4.3 TARGET FUNCTIONAL SEQUENCE

The detailed sequence of events at the target for the computation of the response is shown in figure 3.0 below.



- 3. The Emission cone parameters are extracted.**
- 4. The interrogation sector is computed relative to the interrogator (source).**
- 5. The CCTT API is used to call on other CCTT subsystems.**
- 6. The local entity (Transponder) location is evaluated against the computed sector (scenario). If the transponder is within the sector an affirmative response is packaged into an Event Report PDU. If not, no response is sent.**
- 7. The response data is packaged in an Event Report PDU.**
- 8. The Data PDU is sent as a DIS Network Broadcast.**
- 9. The response arrives at the Interrogator (source).**
- 9a) The AAR captures the Event Report PDU (response) and correlates it to the original Emission PDU (Interrogation). These would be used to produce a BCIS performance report.**
- 10. Interrogator broadcasts results of BISEP API in an Event Report PDU to the AAR.**

4.4 PDU DATA FLOW

Two new enumerations were added for BCIS event report PDUs:

- BCIS response data
- BCIS bisepts data

BCIS interrogators send out an Electromagnetic Emission PDU (EMPDU) each time a BCIS interrogation is made. Per the DIS Standard, an EMPDU can represent N systems, with M_i number of beams for the i th system, and P_j targets in the track/jam field in beam j . The CCTT BCIS implementation assumes $i = 1$ and $j = 0$. Therefore, there is only 1 system with 1 beam. This EMPDU therefore has a length of 800 bits (224 header, 160 to define the emitter, 416 to define the beam).

Each interrogator uses a EMPDU transmission frequency between 38_000_000_000 Hz and 38_600_000_000 Hz. Before responding, each responder will validate that the EMPDU transmission frequency is in this range.

Each interrogator outputs the beam Az & El parameters. Before responding, each responder will validate that it is within the volume defined by:

- The emitters initial location defined in the EMPDU
- The beam Az
- The beam El
- The range constraints of the system. Typically 150 to 5500 meters. CCTT uses a config file to control this.

Responders then reply with an "BCIS Response" Event Report PDU. The Variable Datum ID for this record is 63250. This Event Report contains the following data in a Variable Datum:

for Response_Record_Type use
record
Transponder_Loc at 0 range 0 .. 191;

```
Site_Id at 0 range 192 .. 207;  
Application_Id at 0 range 208 .. 223;  
Event_Id at 0 range 224 .. 239;  
Bcis_Equipped at 0 range 240 .. 247;  
Valid_Bcis_Response at 0 range 248 .. 255;  
end record;  
for Response_Record_Type'Size use 256;
```

where Transponder_Loc is the Geo Centric coordinates of the Transponder. 64 bits x, 64 bits y, 64 bits z. Site_Id, Application_Id, and Event_Id are the EVENT ID from the EMPDU (for correlation back to the emitter).

A flag denoting whether or not a responder is BCIS equipped.

A flag denoting Valid_Bcis_Response (whether or not this response should be used).

In CCTT, the interrogator then runs all of the responses through the GATECH BISEPS code, which determines the final outcome.

Capability Area: Battlefield Combat Identification System (BCIS)

Paragraph Title	Capability Area	Capability Detail	Testable Attribute	Attribute Test Sequence	Entry Level Test / Drop Back Level					Test Approach			Manual Test Method Available	Test Notes
					1	2	3	4	5	DIS Tool Test	Output/Visual Inspection during exercise	Code and/or Data File Inspection		
Functional Performance	Infrastructure	Support for receiving/processing Interrogator	bcis_recv_interrogator_data	1.1	0							Y		Simulator must contain transponder to communicate with BCIS module
	Infrastructure		bcis_recv_interrogator_emission_pdu	2.1		1				Y				Simulator must be able to receive emission PDU's from BCIS module
	Infrastructure		bcis_transmit_event_report_pdu	2.2		1				Y				Simulator must be able to respond with Event Report PDU to BCIS module after receiving interrogation request.
Interrogator Performance	Infrastructure	Support for Interrogating simulators in CCTT exercise - Applies to any "Shooter" module in the exercise	bcis_interrogator_initiation	1.2	0							Y		"Shooter" simulator must have capability of initiating the BCIS interrogation sequence.
	Infrastructure		bcis_interrogator_transmit_emission_pdu	2.3		1				Y				"Shooter" simulator must have capability of sending BCIS emission PDUs.
	Infrastructure		bcis_interrogator_receive_transponder_event_report_pdu	2.4		1				Y				"Shooter" simulator must be able to receive/process response PDUs.
	Infrastructure		bcis_interrogator_transmit_event_report_pdu	2.5		1				Y				"Shooter" simulator must transmit event_report_pdu to AAR with results of interrogation

APPENDIX A – CCTT MODEL LIST

1. DYNAMIC MODELS

The current dynamic models are included in either the Moving Model lots or the Own-Vehicle Model lots as follows.

Moving Model Lot 1 - Aircraft:

- A10 Warthog
- SU25 Frogfoot
- AH1S Cobra
- AH64 Apache
- OH58D Kiowa Warrior
- MI-24P Hind
- MI-28 Havoc-A
- MI-8T Hip

Moving Model Lot 2 - Aircraft

- F16 Falcon
- MIG27 Flogger
- SU17 Fitter
- SU24 Fencer
- UH60 Blackhawk
- KA-50 Hokum-A

Moving Model Lot 3 - NATO Vehicles

- Challenger, British Main Battle Tank (MBT), 120mm
- Chieftain, British MBT Mk5/5P, 120mm
- Warrior, British Armored Personnel Carrier (APC)
- AMX10P, French
- AMX10 RC, French, 105mm
- AMX30 B2, French MBT, 105mm
- AMX40 LeClerc, French MBT, 120mm
- LEOPARD IA4, German MBT, 105mm
- LEOPARD II, German MBT, 120mm
- Marder 2, German APC

Moving Model Lot 4 - US Ground Vehicles

- M1A1 Abrams MBT, 120mm
- M1A2 Abrams MBT, 120mm
- M2A2/M3A2 Bradley, CFV/IFV, 25mm

- M113A3 APC
- M577A1, A2 APC, Command Post

Moving Model Lot 5 - US Ground Vehicles

- AVLB M60 Series Bridge Launcher
- M728 Combat Engineering Vehicle (CEV)
- M9 Armored Combat Earthmover (ACE)
- M58A3 MCLIC
- Mine Plows for HEMTT and M1A1
- Mine Rollers for HEMTT and M1A1

Moving Models Lot 6 - US Ground Vehicles

- M977 HEMTT, Cargo
- M978 HEMTT, Fuel Service
- M984E1 HEMTT, Wrecker
- M985 HEMTT, Cargo
- M88A2 Recovery Vehicle

Moving Models Lot 7 - US Ground Vehicle

- M270 MLRS
- M981 FIST-V
- M109A6, Self-Propelled Howitzer
- M992 FAASV
- M1064 Mortar Carrier with BMS 120

Moving Models Lot 8 - US Ground Vehicles

- M1078 LMTV, 2.5 ton
- M1079 LMTV, van
- M1083 MTV, 5 ton
- M1083 MTV, 5 ton with volcano
- M1089 MTV, Wrecker
- M1091 MTV, 5 ton Pol Tanker

Moving Models Lot 9 - CIS Ground Forces

- 2S1, 122mm Self-propelled Howitzer
- 2S3, 152mm Self-propelled Howitzer
- 2S6, Quad 30mm
- 2S19, 152mm Self-propelled Howitzer
- ACRV, 1V12
- T72 B with Reactive Armor
- T72M (or C) without Reactive Armor

- T80 without Reactive Armor
- T80 U with Reactive Armor

Moving Models Lot 10 - CIS Ground Vehicles

- 2S31, Combination Gun mounted in BMP
- BMP IKsh, Command and Communications Vehicle
- BMP IP, 73mm and AT5
- BMP II, 30mm and AT5
- BMP III, 100mm, 30mm, and AT-10
- BRDM 2, ATGM, with 5 AT5
- BRDM 2, Recon, 14.5mm and 7.62mm machine gun
- SA-13, AD Missile Artillery
- SA-15, AD Missile Artillery

Moving Models Lot 11 - CIS Ground Vehicles

- 2S23, Combination Gun in BTR 80
- 2S12, 120mm Mortar
- BTR 60P, 14.5mm
- BTR 80, 14.5mm
- D30, 122mm Howitzer, Towed
- T62 without Reactive Armor
- T64/T64B both with Reactive Armor
- ZSU23-4, Quad 23mm

Moving Models Lot 12 - CIS Ground Vehicles

- BAT-2 Route Clearing Vehicle
- BREM1 Recovery Vehicle
- GMZ Tracked Mine Layer
- KMT-5M Roller/Plow
- MT12
- MTU-20 AVLB
- Truck, GAZ-66
- Truck, UAZ-469
- Truck, KrAZ-255B, Fuel Service
- Truck, KrAZ-255B, Cargo, Heavy

Moving Models Lot 13 - US Ground Vehicles

- M966 HMMWV, Utility Truck with TOW
- M998 HMMWV, Stinger, 1SG, UMCP
- M1025 HMMWV, Utility Truck
- M1043 HMMWV, Armament Carrier with MK19

- M1044 HMMWV, Armament Carrier with M2 .50 cal.
- M93 NBC Recon Vehicle

Own-Vehicle Model Lot 1 - M1A1/M1A2

- M1A1 Own Vehicle Model
- M1A2 Own Vehicle Model
- M1A1/M1A2 GPS Reticle
- M1A1/M1A2 TIS Reticle
- M1A1/M1A2 GAS Sabot/HEP Reticle
- M1A1/M1A2 GAS HEAT Reticle
- M1A1 CWSS Reticle
- M1A2 CITV Reticle

Own-Vehicle Model Lot 2 - M2A2/M3A2

- M2A2/M3A2 Own Vehicle Model
- M2A2/M3A2 ISU Reticle
- M2A2/M3A2 Gunner's Auxiliary Sight

Own-Vehicle Model Lot 3 - M981 FIST-V

- M981 FIST-V Own Vehicle Model
- M981 Optical Acquisition Sight
- M981 Locator Designator/Rangefinder
- M981 Thermal Night Sight
- M981 Observation Station Panoramic Telescope Reticle

Own-Vehicle Model Lot 4 - Dismounted Infantry

- Binocular Reticle
- Dismounted Infantry Weapon Sight
- Dismounted Infantry Compass

Own-Vehicle Model Lot 6 - M113

- M113 Own Vehicle Model

Own-Vehicle Model Lot 7 - HMMWV

- HMMWV Own Vehicle Model

1.1 SPECIAL EFFECTS MODELS

The following special effects model lots are provided in CCTT.

Special Effects Models Lot 1 - Detonations

- Aircraft: Large, medium, and small hit
- High Explosive: Large, medium and small hit
- Armor Piercing: Large, medium and small hit
- Dirt Blast: Large, medium, and small hit
- Water Blast: Large, medium, and small hit
- Mine Clearing Charge
- Flare
- Building: Large, medium, and small hit

Special Effects Models Lot 2 - Moving Model Fire Effects

- Muzzle Flash, Large
- Muzzle Flash, Medium
- Muzzle Flash, Medium-small
- Muzzle Flash, Small
- Machine Gun Fire
- Own Vehicle Muzzle Flash, Medium
- Own Vehicle Muzzle Flash, Small
- Own Vehicle Machine Gun Fire

Special Effects Models Lot 3 - Moving Model Launch Effects

- Missile 1
- Missile 2
- Missile 3
- Missile 4
- Rocket 1
- Rocket 2

Special Effects Models Lot 4 - Other Moving Model Effects

- Vehicle Dust
- Vehicle Fire and Smoke
- Vehicle Smoke
- Aircraft Fire and Smoke
- Aircraft Smoke
- Own Vehicle Dust

Special Effects Models Lot 5 - Dismounted Infantry

- Dismounted Infantry - Friend
- Dismounted Infantry - OPFOR

Special Effects Models Lot 6 - Tactical Smoke Effects

- Tactical Smoke, Air Burst
- Tactical Smoke, Ground Burst

1.2 REPOSITIONABLE MODELS

The following repositionable models lots are provided in CCTT.

Repositionable Model Lot 1 - Obstacles

- Rectangular log crib
- 8 tree abatis
- Building rubble
- Tank ditch
- 3 roll concertina fence

Repositionable Model Lot 2 - Positions

- Armored Vehicle turret/hull defilade position
- Fighting Vehicle turret/hull defilade position
- Mortar Carrier turret/hull defilade position
- Tank turret/hull defilade position
- Infantry fighting position
- Covered machine gun bunker
- Machine gun prepared position
- Overhead covered infantry position

Repositionable Model Lot 3 - Equipment

- M60A1 Series AVLB Bridge
- MTU-20 AVLB Bridge
- Ribbon bridge, 14 sections
- Prestock entity, ammo
- Prestock entity, fuel
- Cleared mine lane

1.3 FEATURE MODELS

The following cultural feature model lots are provided in CCTT.

Feature Model Lot 1 - Rural/Residential

- Houses (6)
- Barns (2)

- Silo
- Mansion house

Feature Model Lot 2 - Airport

- Control tower
- Radar building with radome
- Curved roof hangar
- Flat roof hangar

Feature Model Lot 3 - Industrial

- Flat roof industrial buildings (4)
- Pitched roof industrial buildings (2)
- Brick smokestack building
- Concrete smokestack building
- Steel smokestack building
- Power plant
- Transformer yard
- Sewage treatment plant

Feature Model Lot 4 - Government/Large Residential

- Military barracks
- Government building
- Hospital
- School
- Churches (3)
- Apartments (6)

Feature Model Lot 5 - Bridges/Towers/Tanks

- Concrete overpass bridge
- Steel truss automobile bridge
- Steel truss railroad bridge
- Power pylon
- Microwave tower
- Radio/TV tower
- Water tower
- Storage tank

APPENDIX B – CCTT DISPLAY CONFIGURATIONS

1. M1A1 TANK MODULE

The following requirements apply to the M1A1 module:

- In the M1A1 the Tank Commander has: Six vision blocks and the Commanders Weapon System Sight (CWS) in a slewable cupola just like the actual vehicle and, when applicable, a popped hatch capability with three modes of operation (normal, binocular and NVG).
- In the M1A1 module, three vision blocks and one installable AN/VVS-2 night viewer is provided for the driver. (Total FOV includes mechanical selection of viewing angle)
- In the M1A1 module, one vision block is provided for the Loader. (Total FOV includes mechanical rotation of vision block)
- In the M1A1 module, one circular sight is provided for the gunner's primary sight (GPS) and commander's GPS extension (GPSE).
- In the M1A1 module, one circular sight is provided for the gunner's auxiliary sight (GAS).

Refer to the Visual System Configuration figure for further clarification.

M1A1 Stations	View	Type	Mag	Inst FOV	Total FOV	Min Poly	Calc Lines	Calc Pixels	Res	Det (m)	Rec (m)
Commander's											
	CPH	Day-2HR	1X	36.0x27.4	360x37.4	2380	768	896	6.1	2400	500
	CPH	Day-3LR	1X	36.0x27.4	360x37.4	2380	384	448	-	-	-
	CPH	ANVVS	1X	36.0x27.4	40x30	1400	768	896	6.1	2400	500
	CPH	Binoc	7X	5.3x4.0	7x50	3190	768	896	1.0	4000	2400
	S-VB	Day	1X	34.9x9.0	60x18.0	2380	768	896	6.1	2400	500
	L-VB	Day	1X	25.6x6.5	60x18.0	2380	768	896	6.1	2400	500
	CWS	Day	3X	6.7 +/-0.5	-	2350	768	896	3.5	4000	900
	GPSE	Day	3X	18.9x14.2	-	2180	768	1024	2.8	4000	1100
	GPSE	Day	10X	5.7x4.3	-	1360	768	1024	0.9	4000	3100
	GPSE	TIS	3X	13.3x10.0	-	1830	768	1024	2.8	4000	1100
	GPSE	TIS	10X	4.6x2.5	-	2150	768	1024	0.8	4000	3100
Gunner's											
	GPS	Day	3X	18.9x14.2	-	2180	768	1024	2.8	4000	1100
	GPS	Day	10X	5.7x4.3	-	1360	768	1024	0.9	4000	3100
	GPS	TIS	3X	15.4x8.3	-	1830	768	1024	2.8	4000	1100
	GPS	TIS	10X	4.6x2.5	-	1350	768	1024	0.8	4000	3100
	GAS	Day	8X	7.1x5.4	-	1450	768	1024	1.2	4000	2400
	UW	Day	1X	18.0x6.0	-	2150	160	480	6.1	2400	500
Driver's											
	Left	Day	1X	22.3x9.0	32.8x18	2390	256	640	6.1	2400	500
	Cent	Day	1X	34.9x9.0	60x18.0	3180	256	1024	6.1	2400	500

	Cent	ANVVS	1X	35.2x18.0	125x18.0	3200	256	512	6.1	2400	500
	Right	Day	1X	22.3x9.0	32.8x18	2390	256	640	6.1	2400	500
Loader's											
	VB	Day	1X	34.9x9.0	360x18.0	3180	256	1024	6.1	2400	500

Table 4

2. M1A2 TANK MODULE

The following requirements apply to the M1A2 module:

- In the M1A2 the Tank Commander has: Eight vision blocks in a cupola just like the actual vehicle and, when applicable, a popped hatch capability with three modes of operation (normal, binocular and NVG).
- In the M1A2 module the commander's popped hatch is supported, when applicable.
- For the M1A2 Tank Commander the Commander's Independent Thermal Viewer (CITV) is provided.
- In the M1A2 module, three vision blocks and one installable AN/VVS-2 night viewer is provided for the driver. (Total FOV includes mechanical selection of viewing angle.)
- In the M1A2 module, one vision block is provided for the Loader. (Total FOV includes mechanical rotation of vision block.)
- In the M1A2 module, one circular sight is provided for the gunner's primary sight (GPS) and commander's GPS extension (GPSE).
- In the M1A2 module, one circular sight is provided for the gunner's auxiliary sight (GAS).

Refer to the Visual System Configuration figure for further clarification.

M1A2 Stations	View	Type	Mag	Inst FOV	Total FOV	Min Poly	Calc Lines	Calc Pixels	Res	Det (m)	Rec (m)
Commander's											
	CPH	Day-2HR	1X	36.0x27.4	360x37.4	2380	768	896	6.1	2400	500
	CPH	Day-3LR	1X	36.0x27.4	360x37.4	2380	384	448	-	-	-
	CPH	ANVVS	1X	36.0x27.4	40x30	1400	768	896	6.1	2400	500
	CPH	Binoc	7X	5.3x4.0	7x50	3190	768	896	1.0	4000	2400
	VB	Day	1X	34.9x9.0	45x18.0	2380	768	896	6.1	2400	500
	CITV	TIS	3X	10x7.5	-	1650	768	896	1.5	4000	2000
	CITV	TIS	10X	3.0x2.2	-	1200	768	896	0.5	4000	4000
	GPSE	Day	3X	18.9x14.2	-	2180	768	1024	2.8	4000	1100
	GPSE	Day	10X	5.7x4.3	-	1360	768	1024	0.9	4000	3100
	GPSE	TIS	3X	13.3x10.0	-	1830	768	1024	2.8	4000	1100
	GPSE	TIS	10X	4.6x2.5	-	2150	768	1024	0.8	4000	3100
Gunner's											
	GPS	Day	3X	18.9x14.2	-	2180	768	1024	2.8	4000	1100
	GPS	Day	10X	5.7x4.3	-	1360	768	1024	0.9	4000	3100
	GPS	TIS	3X	15.4x8.3	-	1830	768	1024	2.8	4000	1100
	GPS	TIS	10X	4.6x2.5	-	1350	768	1024	0.8	4000	3100
	GAS	Day	8X	7.1x5.4	-	1450	768	1024	1.2	4000	2400

	UW	Day	1X	18.0x6.0	-	2150	160	480	6.1	2400	500
Driver's											
	Left	Day	1X	22.3x9.0	32.8x18	2390	256	640	6.1	2400	500
	Cent	Day	1X	34.9x9.0	60x18.0	3180	256	1024	6.1	2400	500
	Cent	ANVVS	1X	35.2x18.0	125x18.0	3200	256	512	6.1	2400	500
	Right	Day	1X	22.3x9.0	32.8x18	2390	256	640	6.1	2400	500
Loader's											
	VB	Day	1X	34.9x9.0	360x18.0	3180	256	1024	6.1	2400	500

3. M2A2 INFANTRY FIGHTING VEHICLE AND M3A2 CAVALRY FIGHTING VEHICLE MODULE

The following requirements apply to the M2A2/M3A2 Bradley fighting vehicle.

- In the M2A2 and M3A2 module, the Tank commander is provided with seven vision blocks and, when appropriate, a popped hatch capability with three modes of operation (normal, binocular and NVG).
- In the M2A2 and M3A2 module, the commander's popped hatch is supported, when applicable.
- For the M2A2 and M3A2 modules, the driver is provided with four M17 vision blocks and one AN/VVS-2 night viewer. (Total FOV includes mechanical selection of viewing angle.)
- For the M2A2 and M3A2 modules, the gunners integrated sight unit including the commanders relay assembly is provided.
- For the M2A2 and M3A2 modules, the gunner's hatch has two vision blocks.
- For the M2A2 and M3A2 modules, the gunner is provided with one circular sight. Backup sight: One circular sight.

Refer to the Visual System Configuration figure for further clarification.

M2/M3 Stations	View	Type	Mag	Inst FOV	Total FOV	Min Poly	Calc Lines	Calc Pixels	Res	Det (m)	Rec (m)
Commander's											
	CPH	Day-2HR	1X	36.0x27.4	360x37.9	3250	768	896	6.1	2400	500
	CPH	Day-3LR	1X	36.0x27.4	360x37.9	3250	384	448	-	-	-
	CPH	ANVVS	1X	36.0x27.4	40x30	3500	768	896	6.1	2400	500
	CPH	Binoc	7X	5.3x4.0	7x50	1500	768	896	1.0	4000	2400
	VB	Day	1X	24.7x6.3	48x12.0	3250	768	896	6.1	2400	500
	ISU	Day	4X	14.2x10.7	-	1900	768	1024	2.3	4000	1300
	ISU	Day	12X	4.8x3.6	-	1300	768	1024	0.8	4000	4000
	ISU	TIS	4X	7.1x5.4	-	1400	384	512	2.3	4000	1300
	ISU	TIS	12X	2.4x1.8	-	1150	384	512	0.8	4000	4000
	BUS	Day	5X	11.4x8.6	-	1600	768	1024	1.7	4000	2000
Gunner's											
	ISU	Day	4X	14.2x10.7	-	1900	768	1024	2.3	4000	1300

	ISU	Day	12X	4.8x3.6	-	1300	768	1024	0.8	4000	4000
	ISU	TIS	4X	7.1x5.4	-	1400	384	512	2.3	4000	1300
	ISU	TIS	12X	2.4x1.8	-	1150	384	512	0.8	4000	4000
	UW	Day	1X	11x5.5	-	2300	256	512	6.1	2400	500
	BUS	Day	5X	11.4x8.6	-	1600	768	1024	1.7	4000	2000
	VB	Day	1X	11x5.5	11x5.5	3000	256	512	6.1	2400	500
Driver's											
	VB	Day	1X	31.2x8.0	43x12.0	3500	256	1024	6.1	2400	500
	Cent	ANVVS	1X	35.2x18.0	125x18.0	3500	256	512	6.1	2400	500

4. M981 FIRE SUPPORT TEAM VEHICLE MODULE (FIST-V)

The following requirements apply to the M981 FIST-V module.

In the M981 FIST-V module, the Commander's hatch/targeting station has Seven M17 vision blocks in a slewable hatch just like the actual vehicle.

For the M981 FIST-V driver, Four M17 vision blocks and one M19 night vision device is provided.

For the M981 FIST-V gunner's sights, the simulated gunner's sights has the capability of selecting an optical acquisition sight, a thermal nightsight, and a ground vehicle laser locator designator/range finder. The circular sight, in optical and thermal modes of operation, has two different magnification levels.

In the M981 FIST-V module, the Observation station panoramic telescope is provided. The simulated observation station panoramic telescope rotates throughout 360 degrees, providing the observation station full horizontal field of view coverage.

Refer to the Visual System Configuration in figure for further clarification.

M981 Stations	View	Type	Mag	Inst FOV	Total FOV	Min Poly	Calc Lines	Calc Pixels	Res	Det (m)	Rec (m)
Commander's											
	VB	Day	1X	31.2x8.0	31.2x8.0		256	1024	6.1	2400	500
	ISU	Day	4X	14.2x10.7	-		768	1024	2.3	4000	1300
	ISU	Day	12X	4.8x3.6	-		768	1024	0.8	4000	4000
	ISU	TIS	4X	7.1x5.4	-		224	300	2.3	4000	1100
	ISU	TIS	12X	2.4x1.8	-		716	964	0.8	4000	3100
Gunner's											
	GPS	OAS	3X	22.6x17.1	-		768	1024	3.7	4000	800
	GPS	OAS	13X	5.3x4.0	-		768	1024	0.8	4000	4000
	GPS	TNS	3X	6.8x5.1	-		768	1024	3.7	4000	800
	GPS	TNS	13X	6.0x3.8	-		768	1024	0.8	4000	4000
Observer's											
	Tele	Day	4X	17.1x12.	-		768	1024	2.1	4000	1600

				8							
Driver's											
	VB	Day	1X	31.2x8.0	34x12.0		256	1024	6.1	2400	500
	Cent	ANVVS	1X	31.2x8.0	-		128	512	6.1	2400	500

5. M113A3 ARMORED PERSONNEL CARRIER (APC)

The following requirements apply to the M113A3 full tracked armored personnel carrier module:

- For the M113A3 APC, the driver has four M17 vision blocks and one M19 night vision device.
- For the M113A3 APC, the commander's cupola is comprised of five vision blocks in a slewable hatch just like the actual vehicle.
- For the M113A3 APC commander's hatch, no visual displays are required.

Refer to the Visual System Configuration figure for further clarification.

M113A3 Stations	View	Type	Mag	Inst FOV	Total FOV	Min Poly	Calc Lines	Calc Pixels	Res	Det (m)	Rec (m)
Commander's											
	VB	Day	1X	31.2x8.0	31.2x8.0	2600	256	1024	6.1	2400	500
Driver's											
	VB	Day	1X	31.2x8.0	34x12.0	2600	256	1024	6.1	2400	500
	Cent	ANVVS	1X	31.2x8.0	-	2600	128	512	6.1	2400	500

6. HIGH MOBILITY MULTIPURPOSE WHEELED VEHICLE (HMMWV) MODULE

Each HMMWV module has a visual display system, which serves both the driver and observer. The HMMWV module has three user selectable modes: unaided eye, binocular, and image intensifier. The driver and forward observer display systems for the HMMWV has multiple direct view displays (minimum monitor size of 19 inches) which together present an instantaneous FOV of 108 by 27.4 degrees.

- For the HMMWV module, a display system serving both the driver and forward observer is provided.

Refer to the Visual System Configuration figure for further clarification.

HMMWV Stations	View	Type	Mag	Inst FOV	Total FOV	Min Poly	Calc Lines	Calc Pixels	Res	Det (m)	Rec (m)
Driver's											
	OTW	Day	1X	36x27.4	108x27.4	3300	768	896	6.1	2400	500
	OTW	Binoc	7X	5.3x4.0	-	1500	768	896	0.9	4000	2400
	OTW	NVG	1X	36x27.4	-	3300	384	448	6.1	2400	500
Observer's											
	OTW	Day	1X	36x27.4	108x27.4	3300	768	896	6.1	2400	500

	OTW	Binoc	7X	5.3x4.0	-	1500	768	896	0.9	4000	2400
	OTW	NVG	1X	36x27.4	-	3300	384	448	6.1	2400	500

7. DISMOUNTED INFANTRY (DI) MODULE

Each DI module has three visual display systems. In the DI module, two of the systems each serves a single operator, squad leader, and the third is shared by the forward observer (FO) and a platoon leader (PL), i.e., the same visual scene serves both the FO and PL. The DI module has three user selectable modes: unaided eye, binocular, and image intensifier. For the DI display system there are multiple direct view displays (minimum monitor size of 19 inches) which together present an instantaneous FOV of 180 by 27.4 degrees. Refer to the Visual System Configurations figures for further clarification.

DI Stations	View	Type	Mag	Inst FOV	Total FOV	Min Poly	Calc Lines	Calc Pixels	Res	Det (m)	Rec (m)
SL											
	OTW	Day	1X	36x27.4	180x27.4	3300	768	896	6.1	2400	500
	OTW	Binoc	7X	5.3x4.0		1500	768	896	0.9	4000	2400
	OTW	NVG	1X	36x27.4		3300	348	448	6.1	4000	500
	Dragon	Day	6X	6.0			768	896	1.3	4000	2400
	Dragon	IR	4X	6.8x3.4			768	896	0.8	4000	2400
	Javelin	Day	4X	6.8x5.4			768	896	1.2	4000	2400
	Javelin	IR	4.2X	6.11x4.58			768	896	1.0	4000	2400
	Javelin	IR	9X	3.0x2.0			768	896	0.4	4000	2400
PL, FO											
	OTW	Day	1X	36x27.4	180x27.4	3300	768	896	6.1	2400	500
	OTW	Binoc	7X	5.3x4.0		1500	768	896	0.9	4000	2400
	OTW	NVG	1X	36x27.4		3300	348	448	6.1	4000	500
	Dragon	Day	6X	6.0			768	896	1.3	4000	2400
	Dragon	IR	4X	6.8x3.4			768	896	0.8	4000	2400
	Javelin	Day	4X	6.8x5.4			768	896	1.2	4000	2400
	Javelin	IR	4.2X	6.11x4.58			768	896	1.0	4000	2400
	Javelin	IR	9X	3.0x2.0			768	896	0.4	4000	2400

8. AFTER ACTION REVIEW CONSOLE - VISUAL DISPLAY

For the AAR console, there is a minimum of three direct view displays (minimum monitor size of 19 inches), which together provide an instantaneous FOV of 120 by 30.5 degrees. The AAR visual display provides the capability to display magnified images equivalent to the selected crew member position when operating and is capable of providing 3X and 10X magnification.

For the AAR console, a 3-channel display system with the following characteristics is provided. Refer to the Visual System Configuration figure for further clarification.

AAR Stations	View	Type	Mag	Inst FOV	Total FOV	Min Poly	Calc Lines	Calc Pixels	Res	Det (m)	Rec (m)
Stealth											

	OTW	Day	1X	40x30.5	120x30.5	3300	768	896	6.8	2400	500
	OTW	IR		40x30.5		1500	768	896	6.8	2400	500
	OTW	NVG	1X	40x30.5	40x30.5	3300	384	448	6.8	2400	500

9. AFTER ACTION REVIEW - DEBRIEF DISPLAY

The AAR debrief display system provides a single channel large screen display with the raster format (number of lines and pixels) being the same as the AAR plan view display. The AAR debrief display deflection circuitry is synchronized/genlocked with the source AAR console to eliminate screen roll during source select.

10. TACTICAL AIR CONTROL PARTY CONSOLE - VISUAL DISPLAY

- For the TACP console, there is a minimum of one direct view display (minimum monitor size of 19 inches) with a computed FOV of 40 by 30.5 degrees.
- For the TACP console, a 1 channel display system with the following characteristics is provided:

TACP Stations	View	Type	Mag	Inst FOV	Total FOV	Min Poly	Calc Lines	Calc Pixels	Res	Det (m)	Rec (m)
Stealth											
	OTW	Day	1X	40x30.5	120x30.5	3500	768	896	6.8	2400	500
	OTW	IR	7X	5.8x4.4		1900	768	896	0.9	4000	2400
	OTW	NVG	1X	40x30.5	40x30.5	3500	384	448	6.8	2400	500

Refer to the Visual System Configuration figure for further clarification.

APPENDIX C – CCTT DISPLAY DIAGRAMS

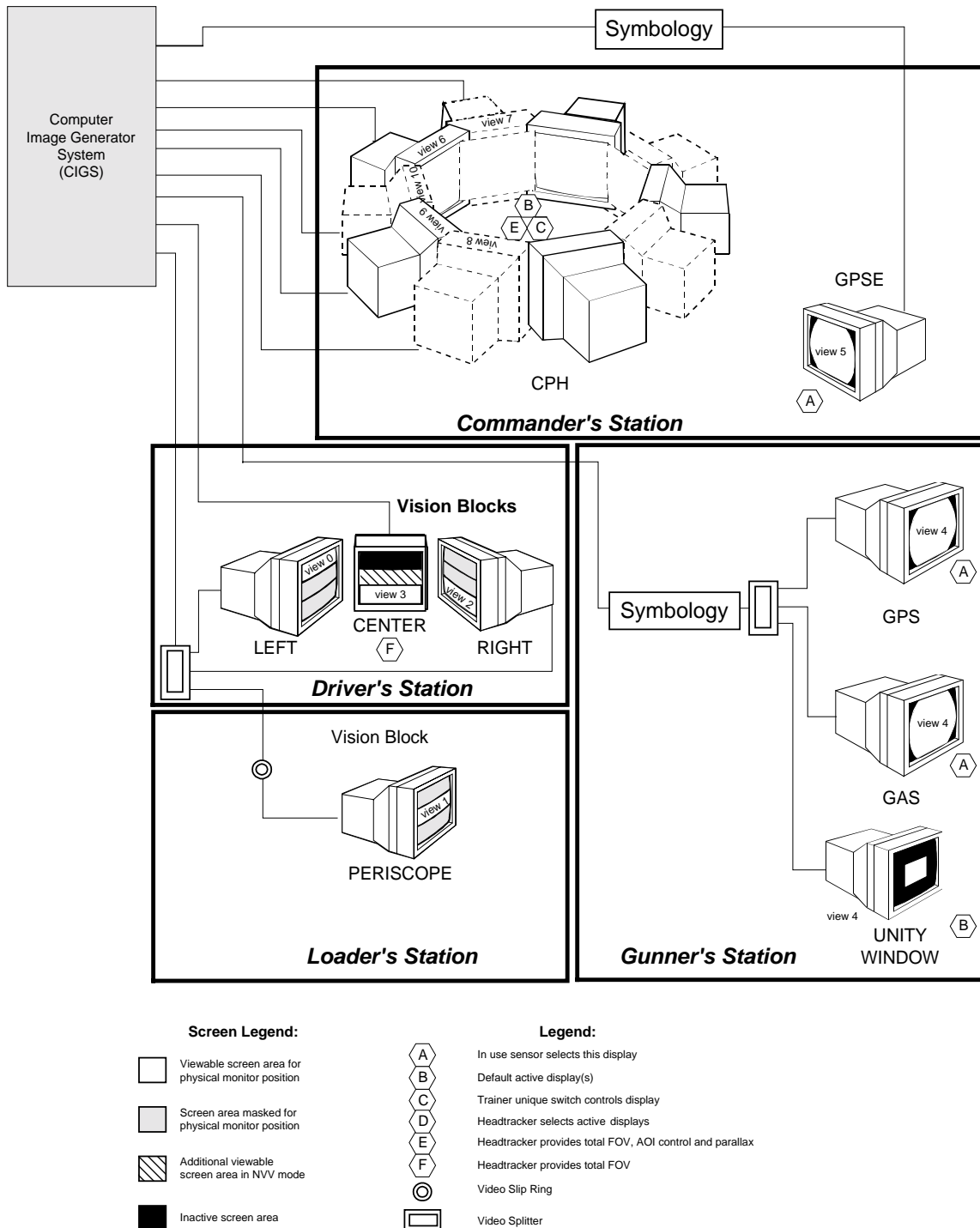


Figure 27 M1A1 Commander's Popped Hatch Module Visual System Configuration

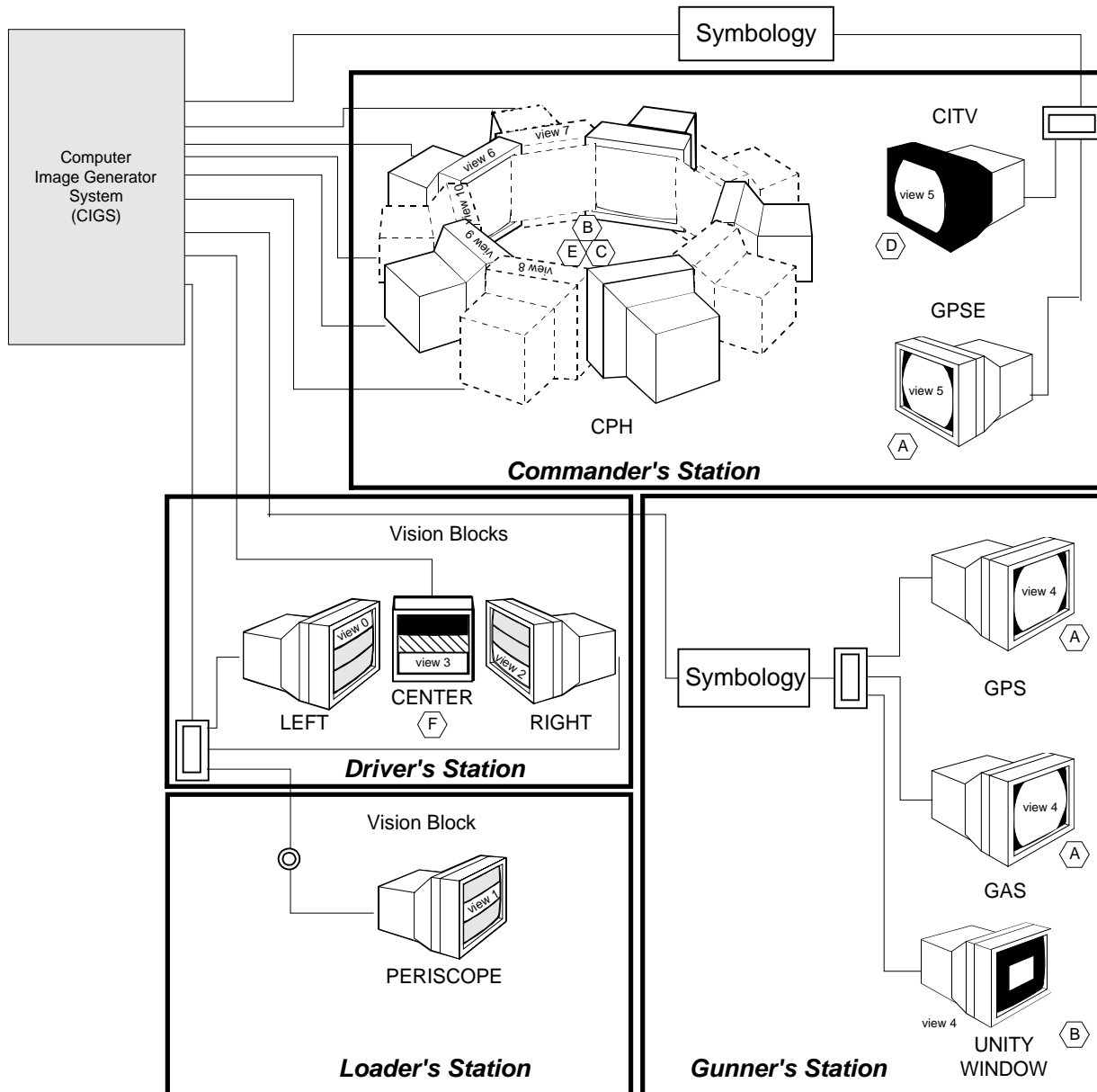


Figure 28 M1A2 Commander's Popped Hatch Module Visual System Configuration

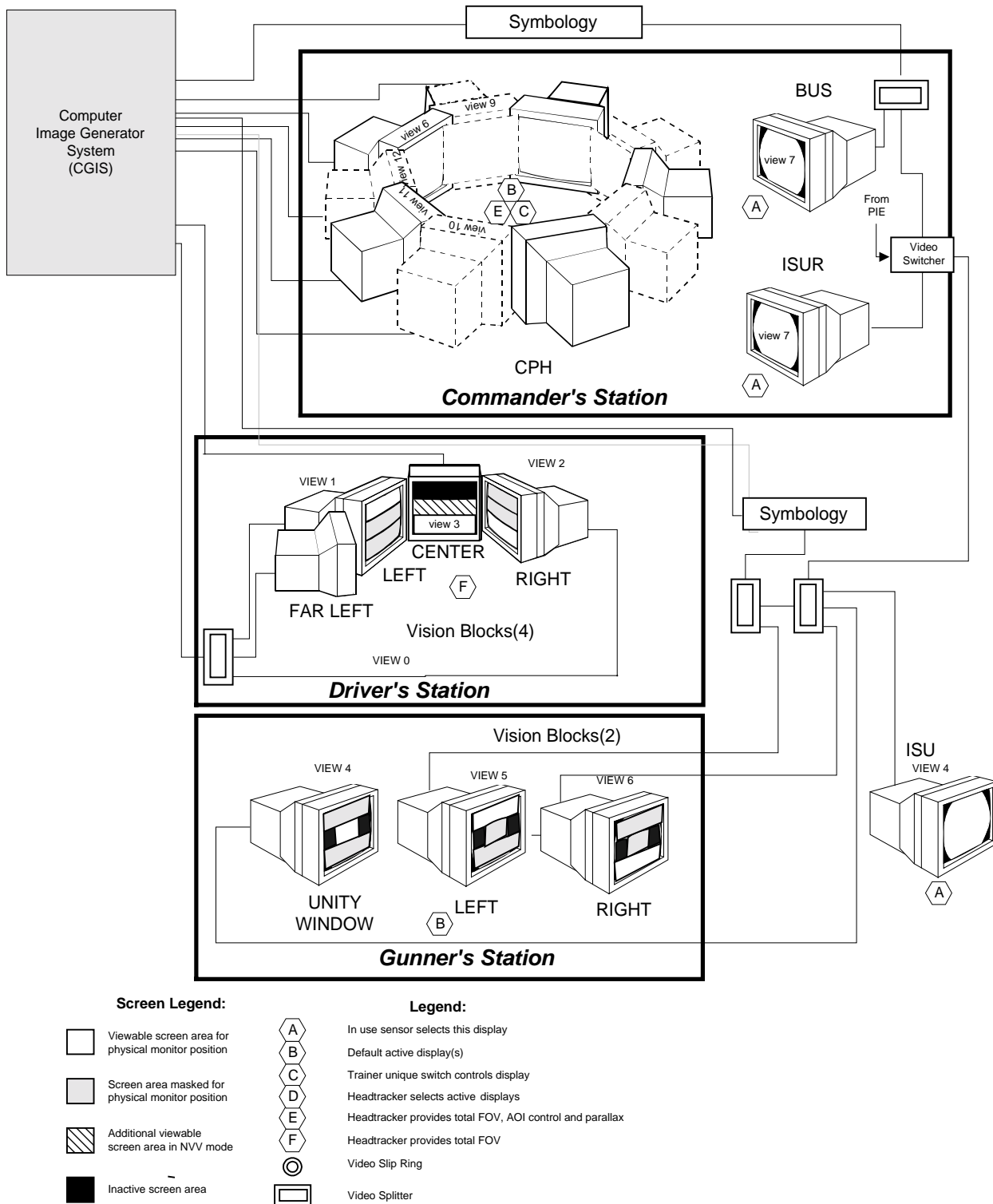


Figure 29 M2A2/M3A2 Commander's Popped Hatch Module

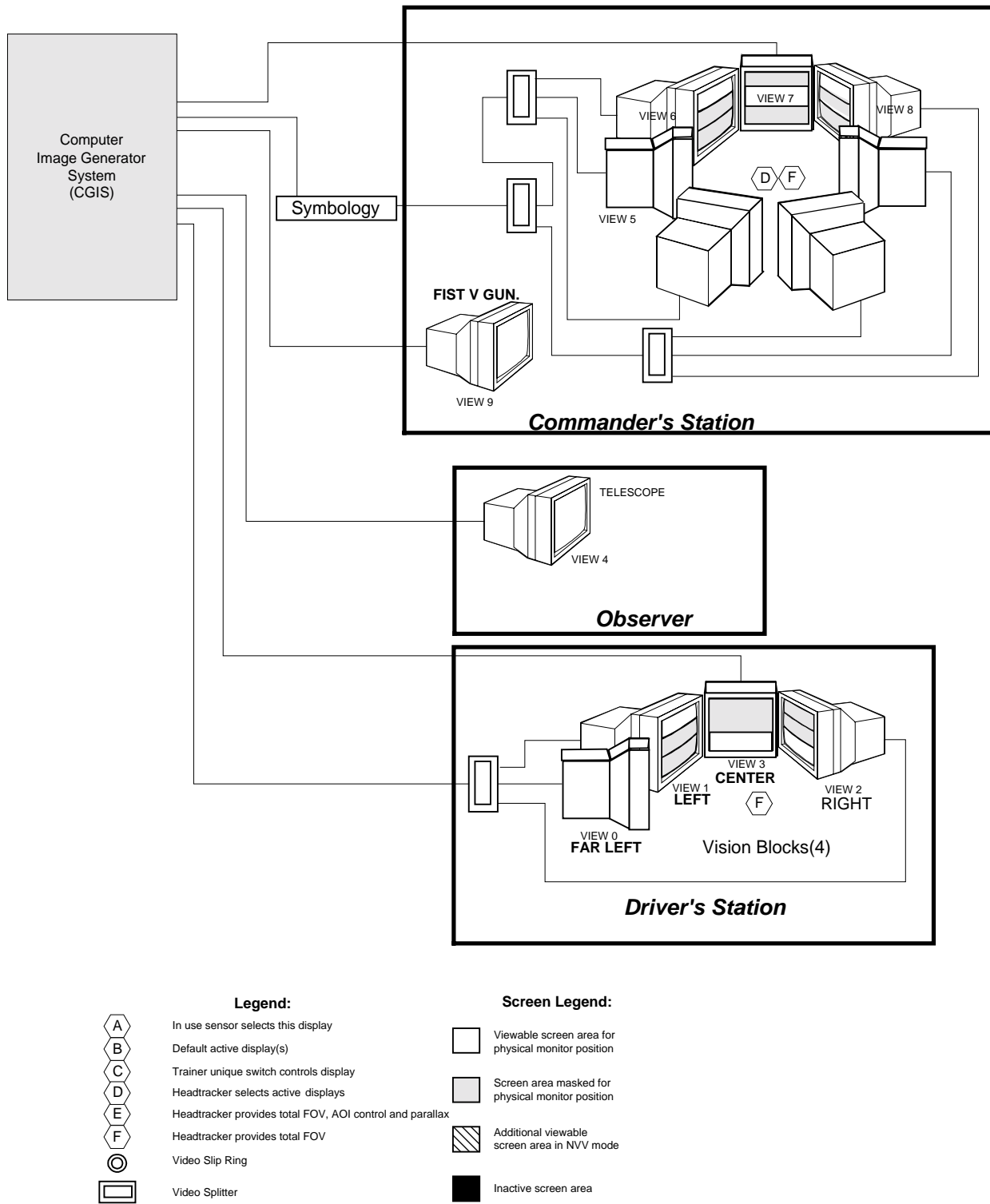


Figure 30 M981 Fire Support Team Vehicle Visual System Configuration

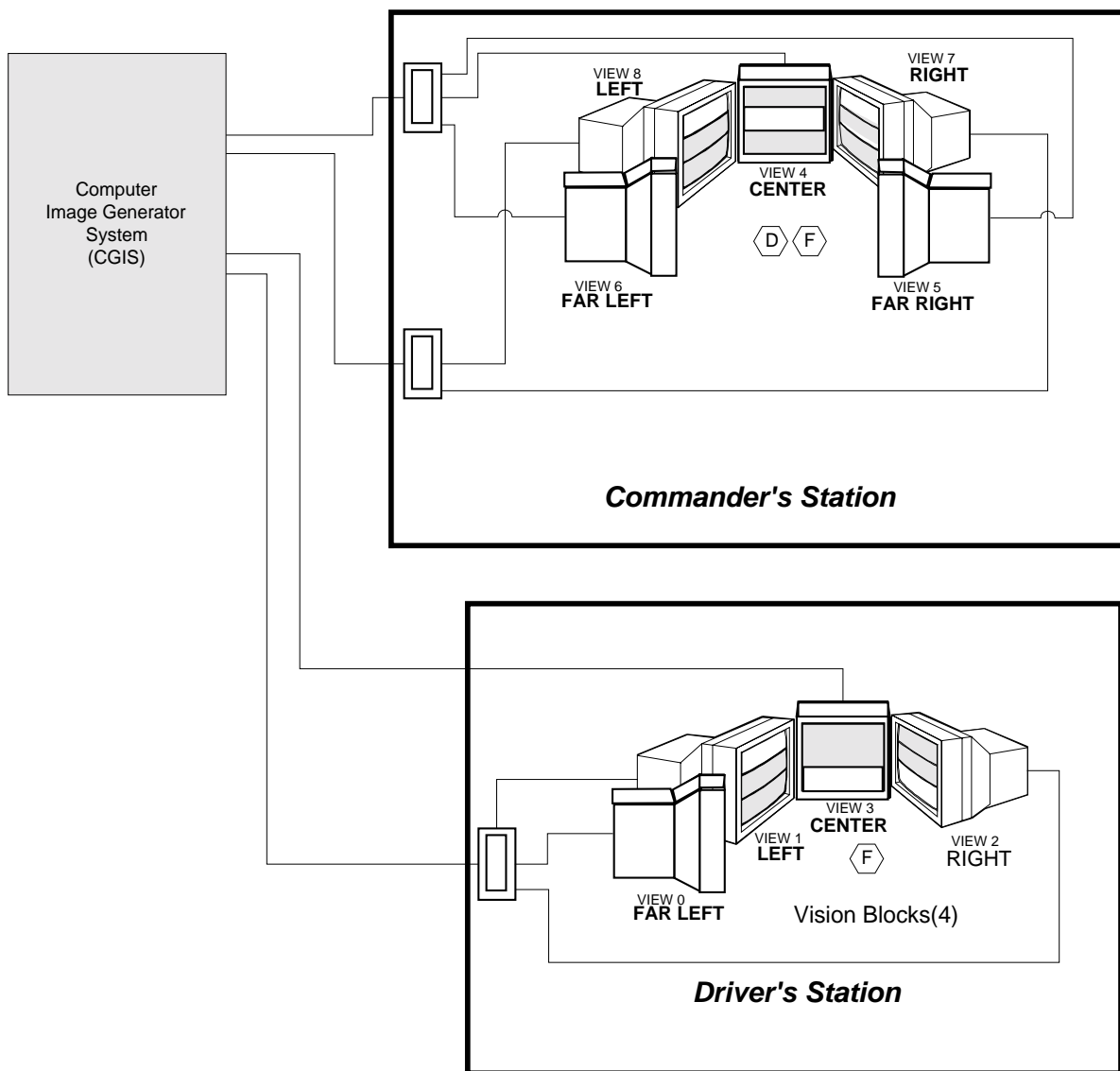


Figure 31 M113 Module Visual System Configuration

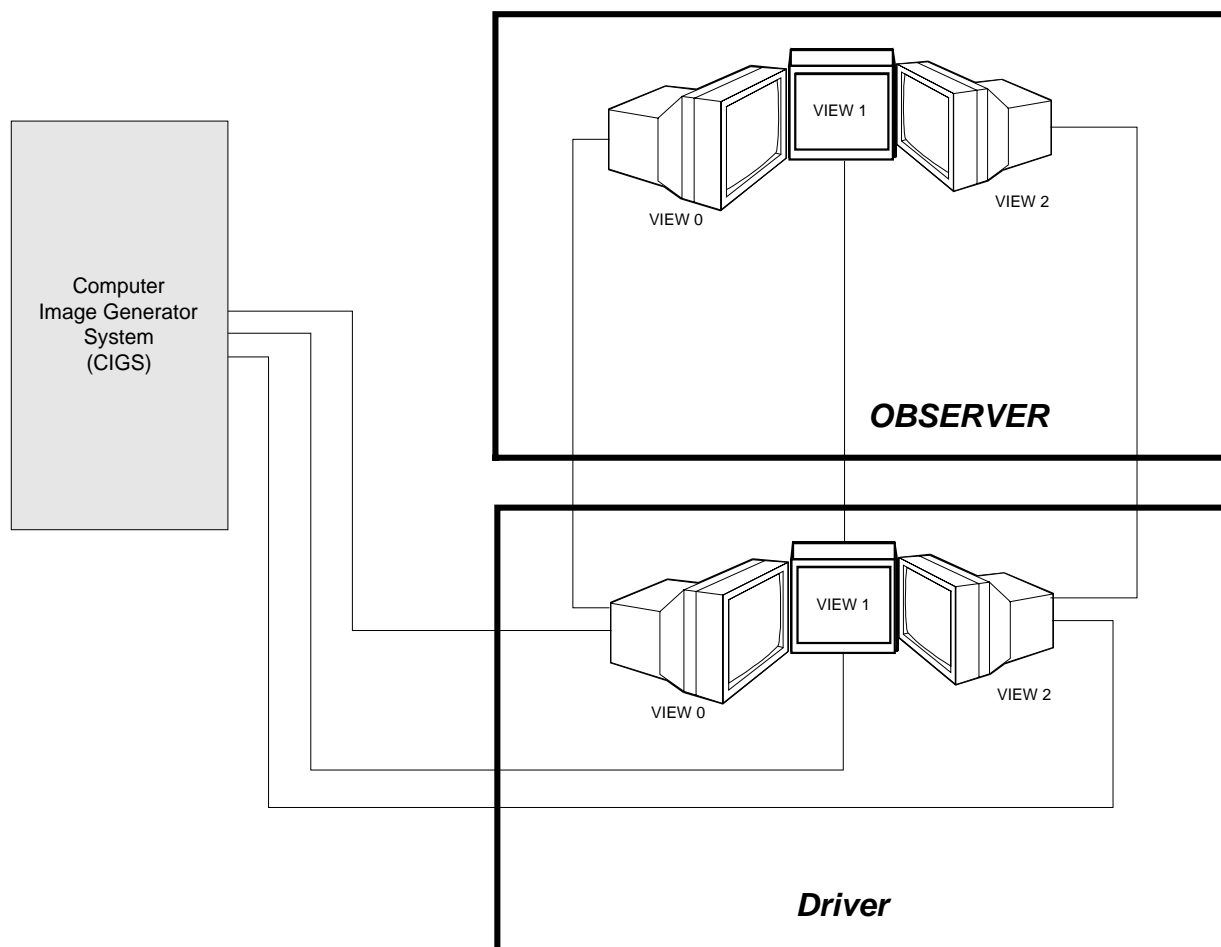


Figure 32 HMMWV Module Visual System Configuration

Figure 33 Dismounted Infantry (DIP) Module Visual System Configuration

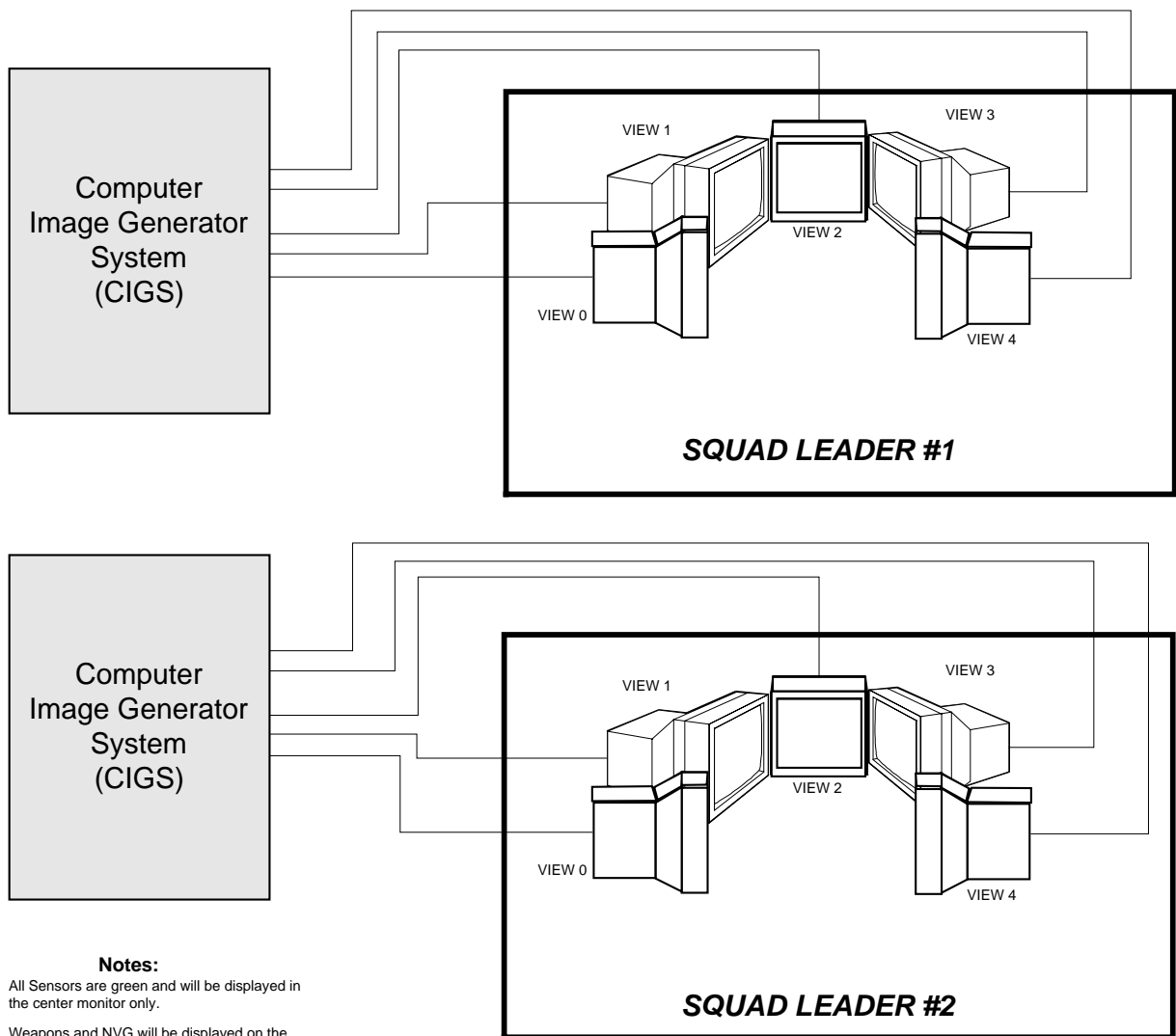
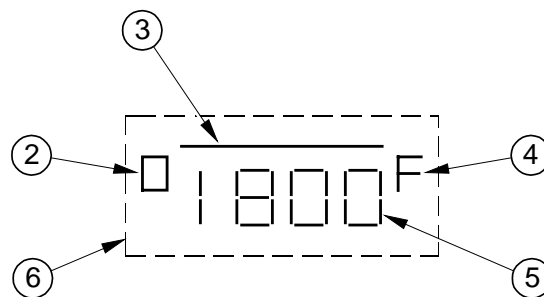
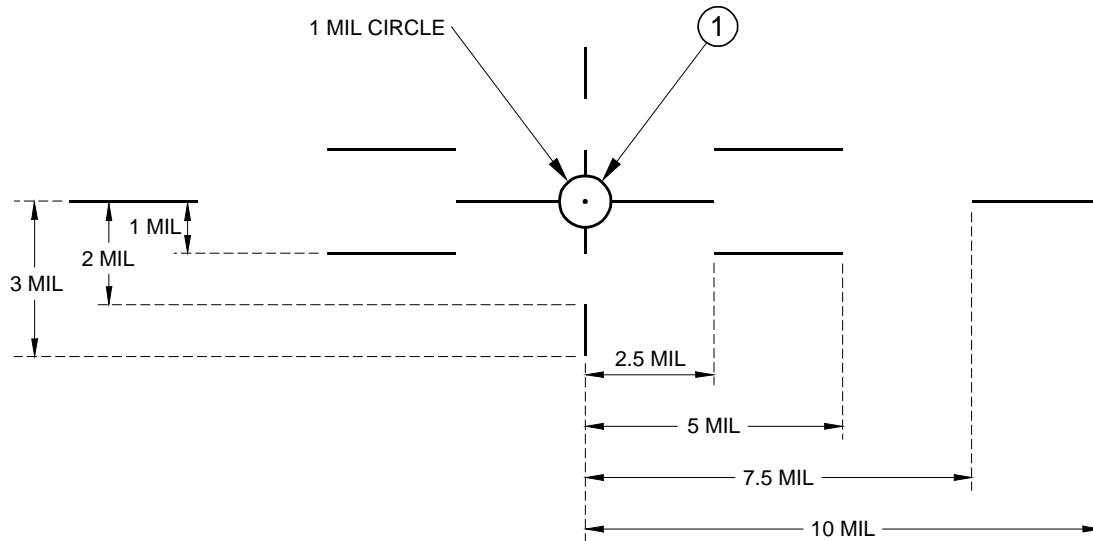


Figure 34 Dismounted Infantry (DIS) Module Visual System Configuration

Figure 35 After Action Review Visual System Configuration

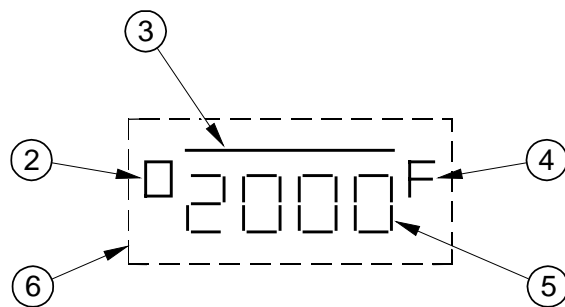
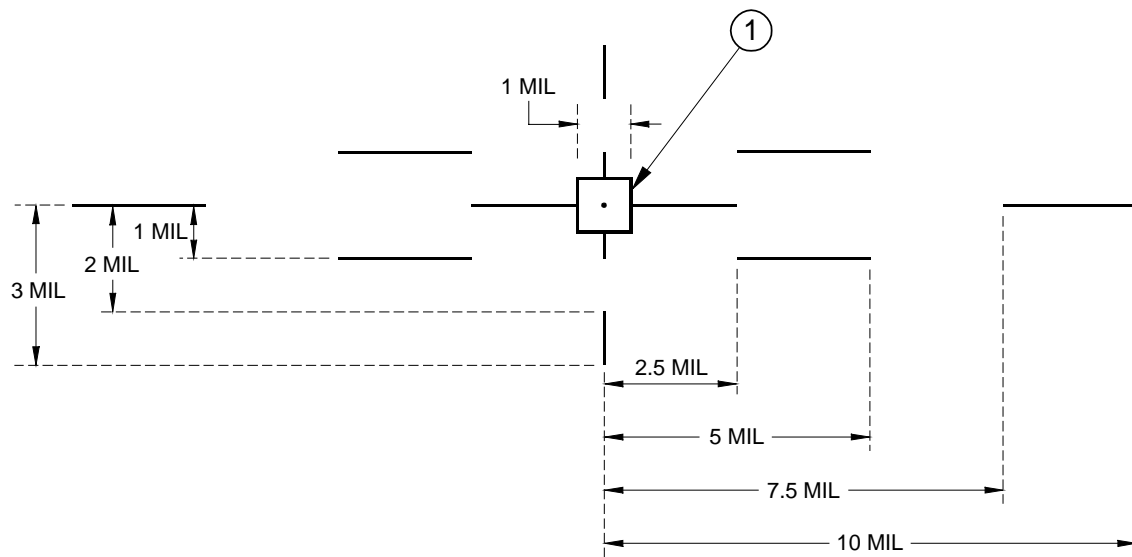
APPENDIX D – CCTT RETICLE, SYMBOLOGY AND MASK DIAGRAMS



- ① RETICLE
- ② READY TO FIRE SYMBOL
- ③ MULTIPLE RETURN BAR
- ④ MALFUNCTION SYMBOL
- ⑤ RANGE SYMBOL
- ⑥ FIRE CONTROL AREA

00072-00AAV2A

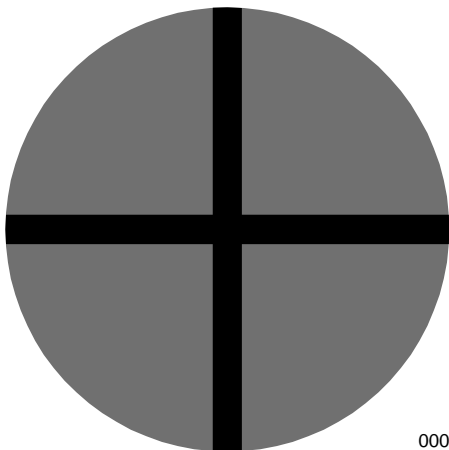
Figure 36. GPS Reticle²



- ① RETICLE
- ② READY TO FIRE SYMBOL
- ③ MULTIPLE RETURN BAR
- ④ MALFUNCTION SYMBOL
- ⑤ RANGE SYMBOL
- ⑥ FIRE CONTROL AREA

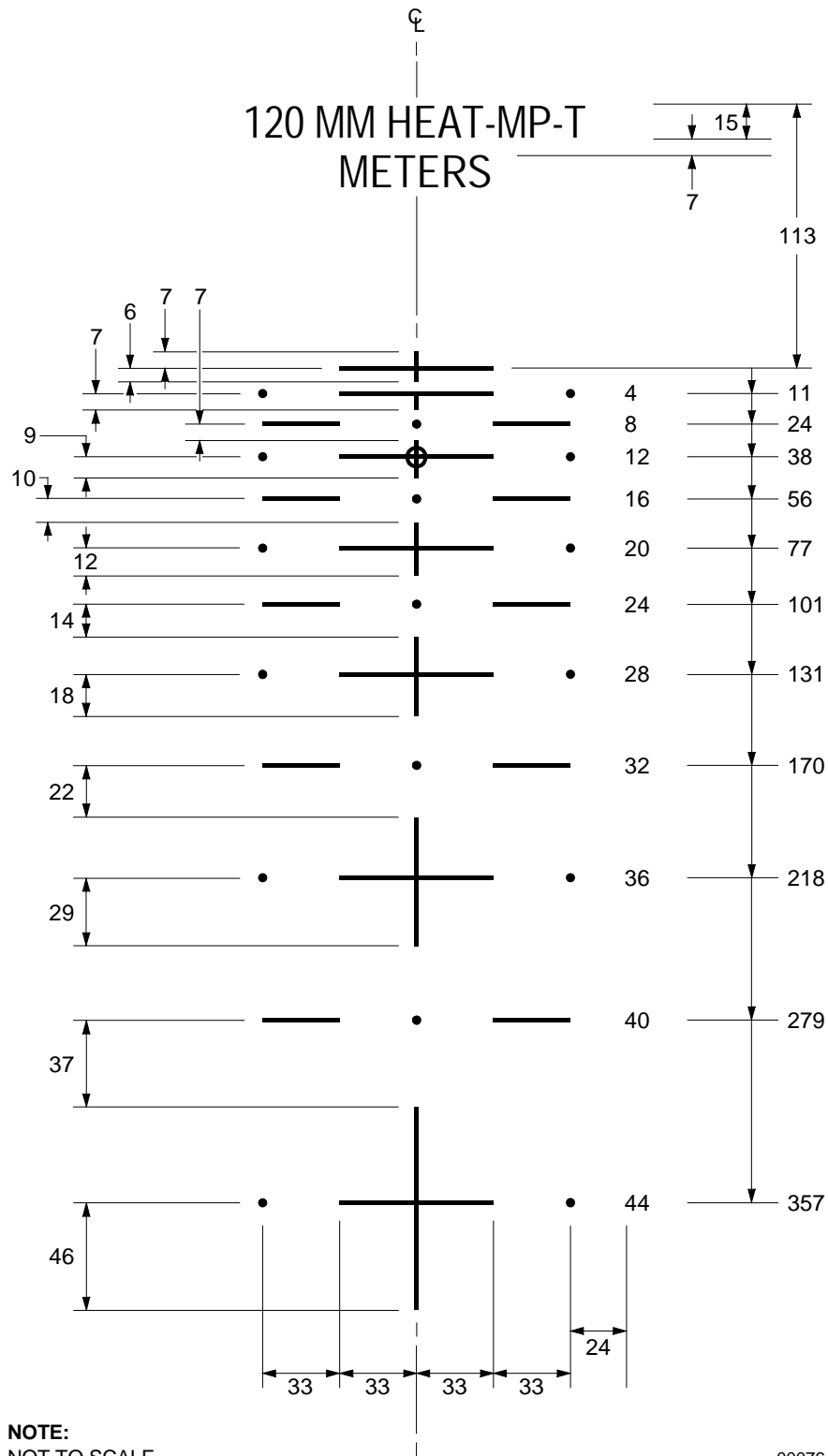
00071-00AAV2A

Figure 37. GPS TIS Reticle²



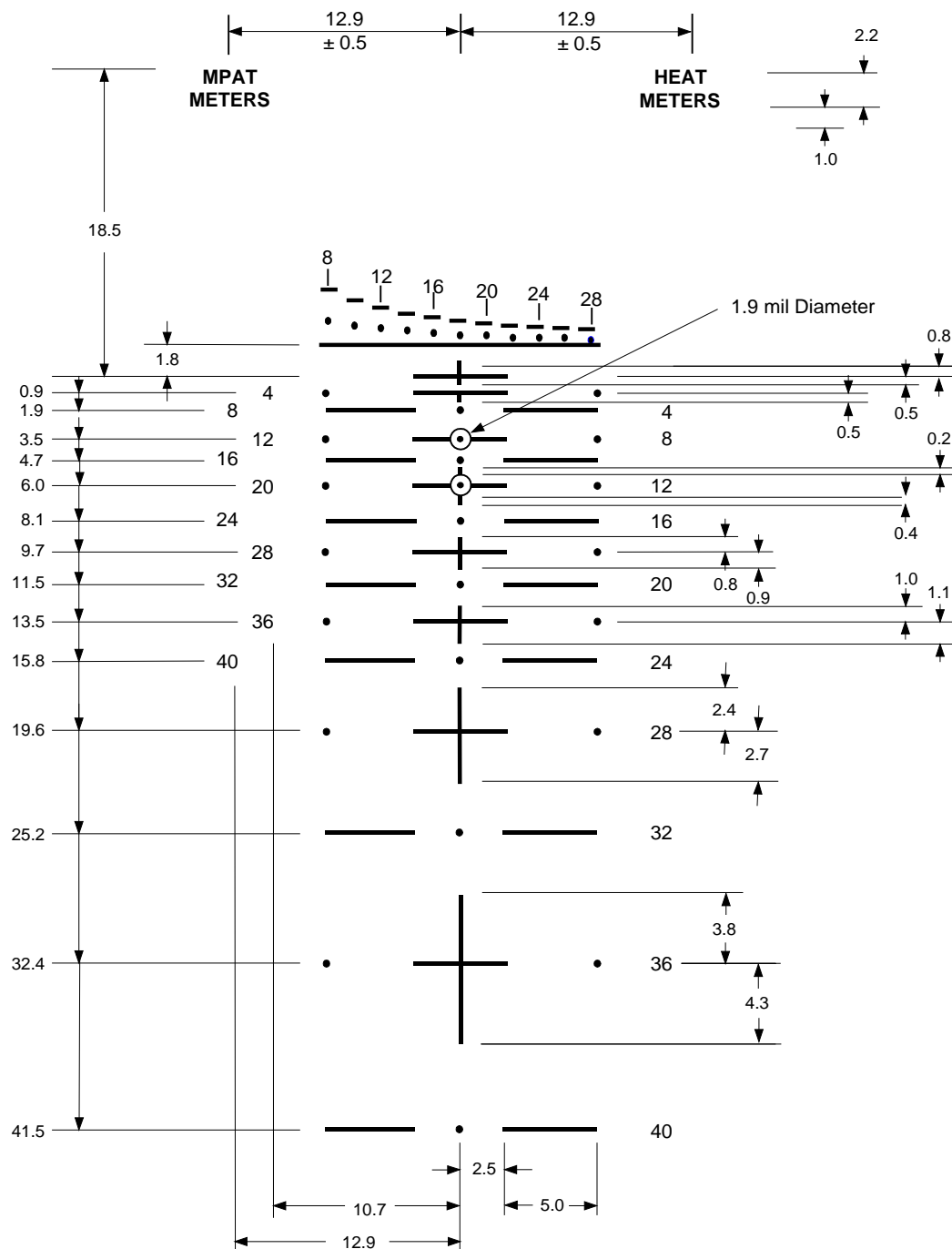
00074-00ABV2A

Figure 38. MRS Reticle²



00076-00ABV5A

Figure 39. GAS Reticle²



NOTE:
Drawing not to scale.

00078-01ABV3A

Figure 40. MPAT/HEAT²

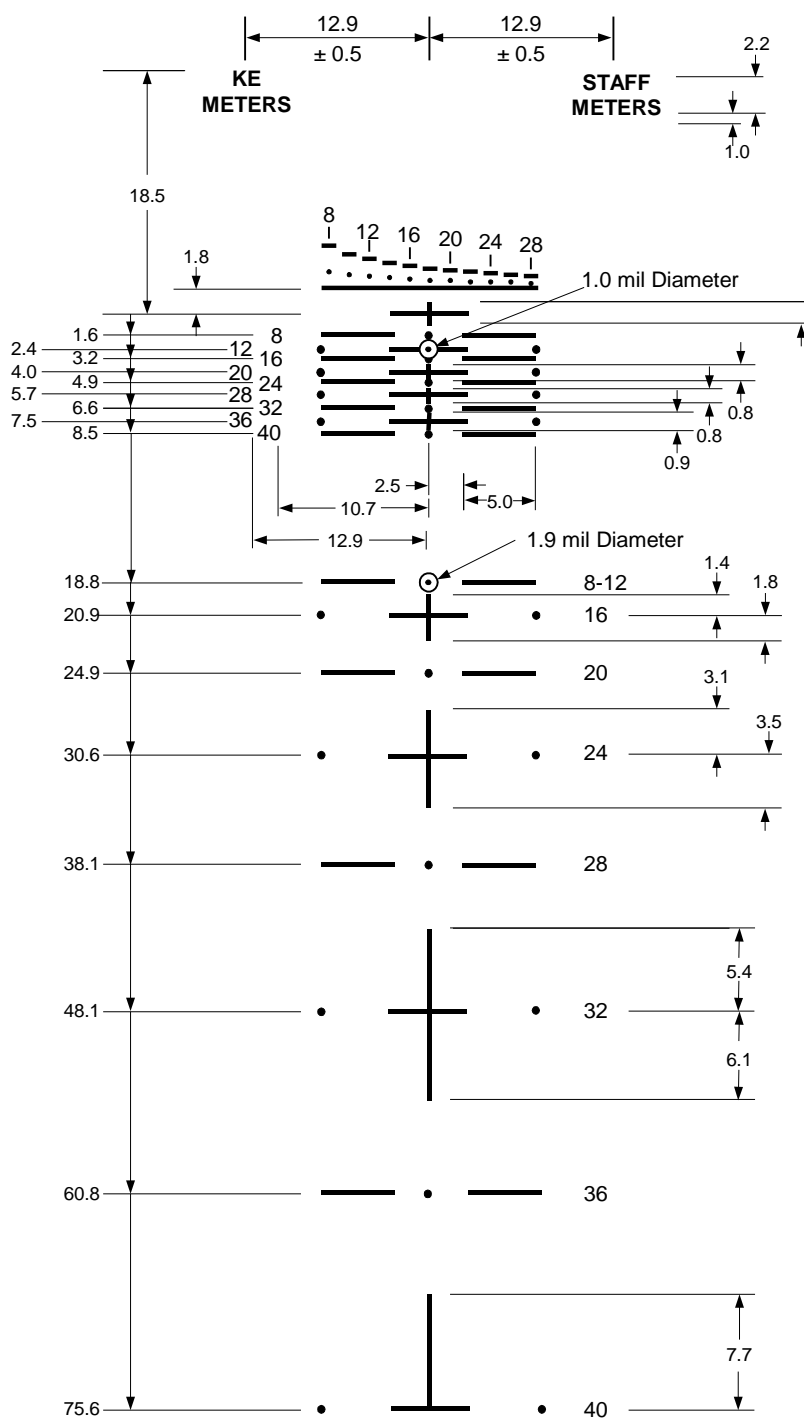
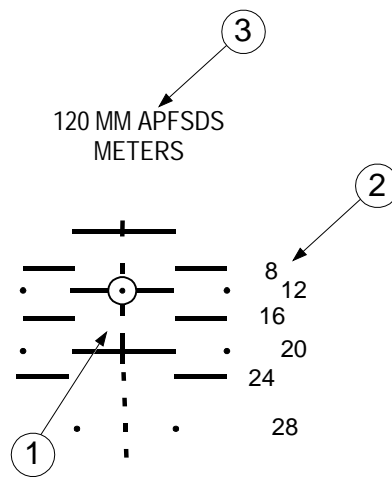


Figure 41. KE/STAFF Reticle²

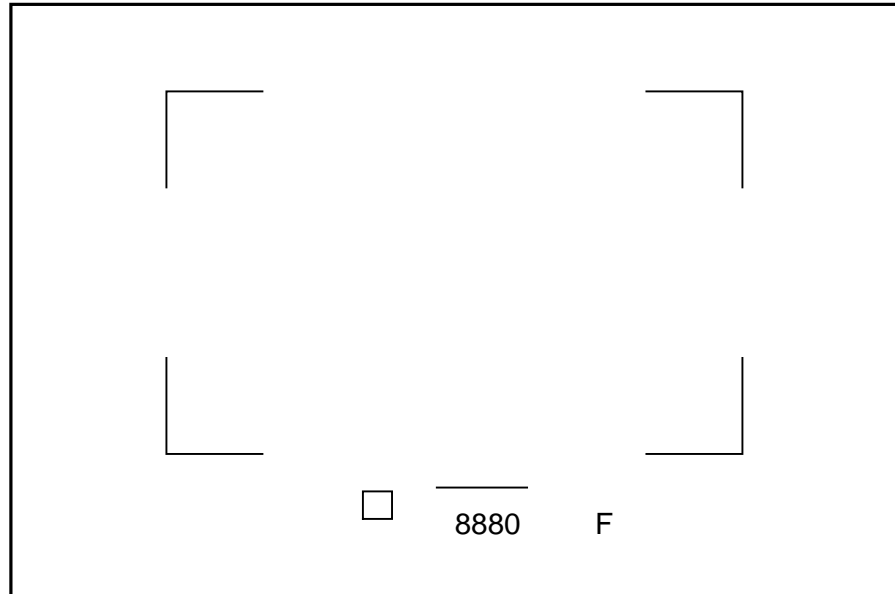


- ① RANGE SYMBOL
- ② RETICLE SYMBOL
- ③ HEADER

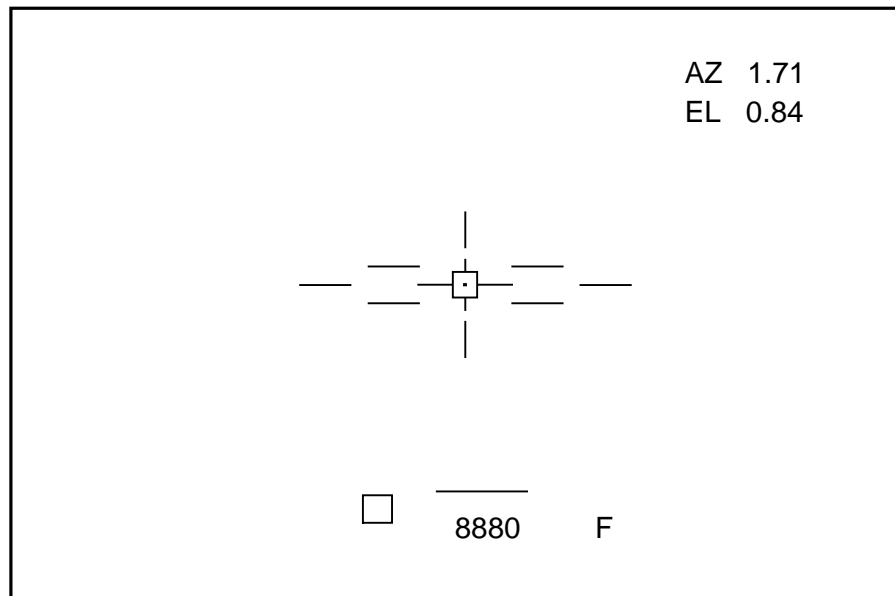
00079-01AAV3A

Figure 42. SABOT Reticle²

Wide FOV

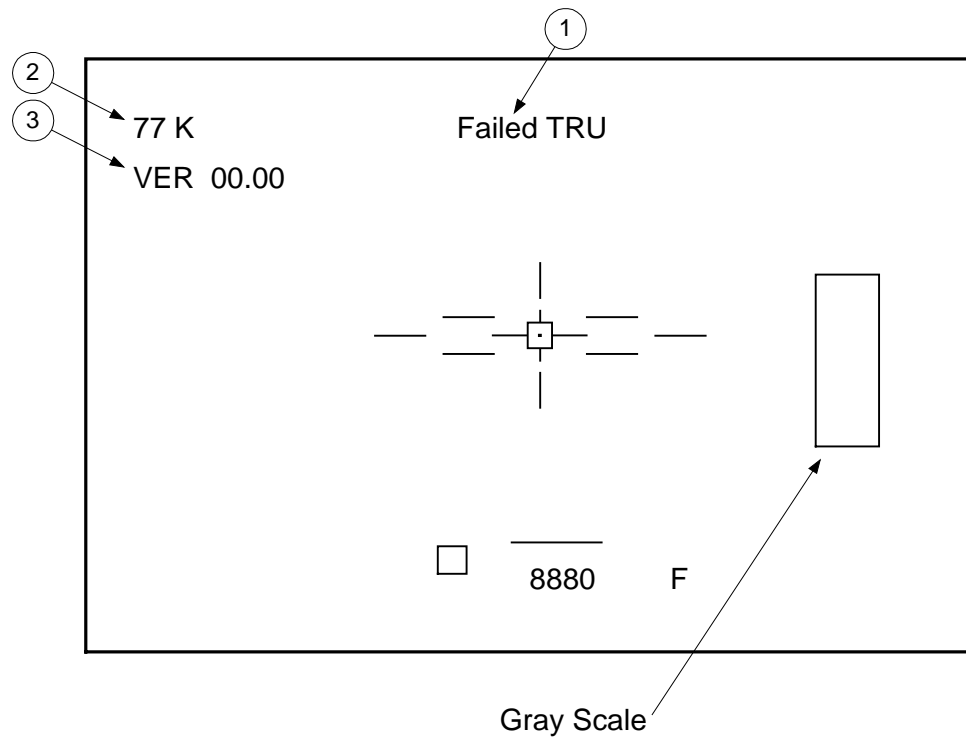


Narrow FOV



00146-00AAV3A

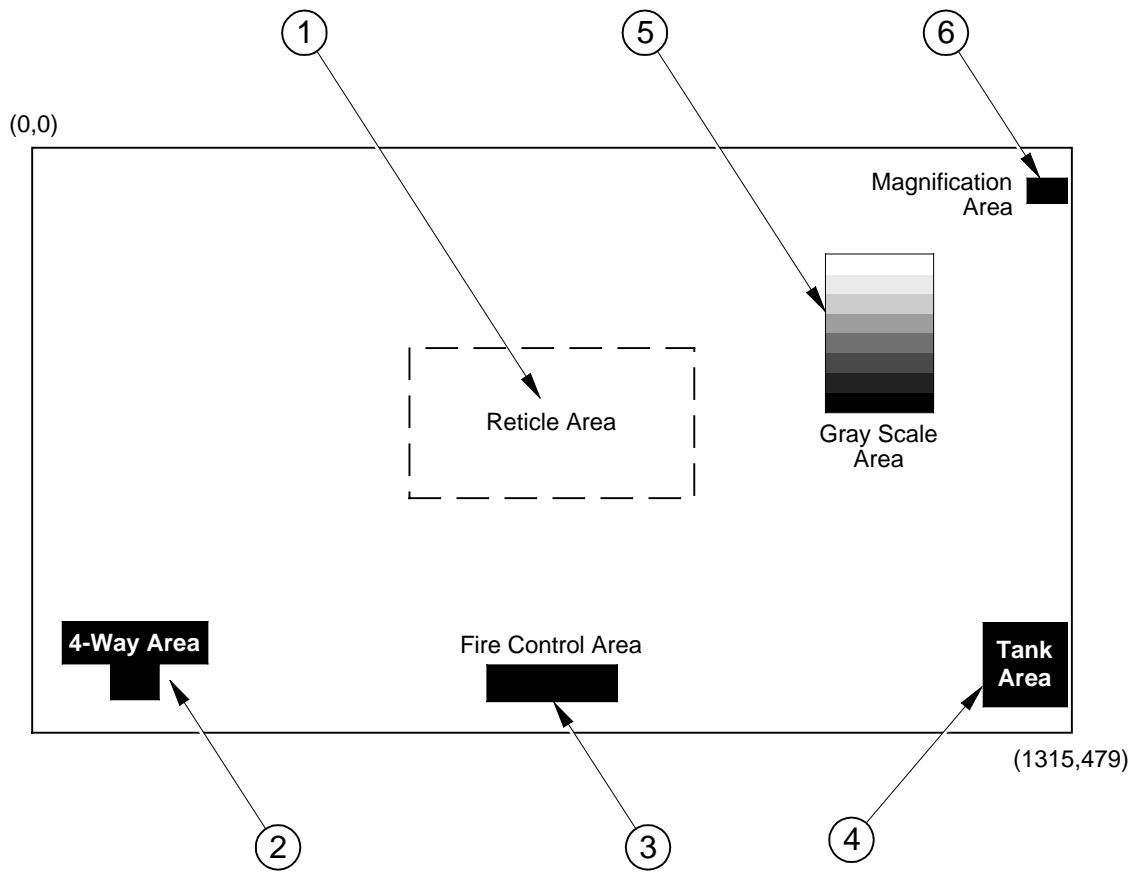
Figure 43. Gunner Biocular Display Reticles²



- ① Bit Status Indicator
- ② Detector Temperature
- ③ Software Version

00147-00AAV3A

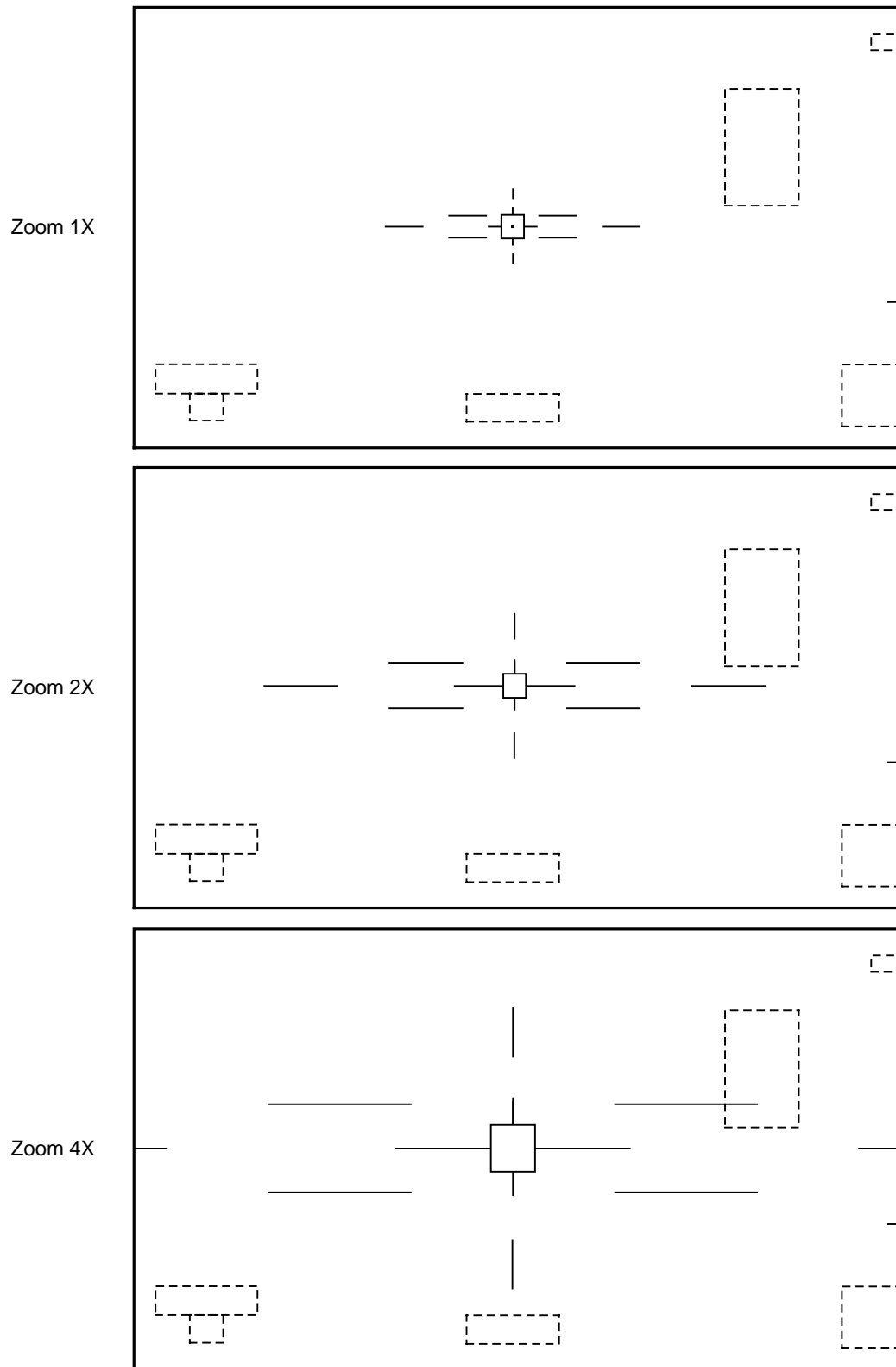
Figure 44. Biocular Display Bit-mode Additions²



- ① Reticle Area
- ② 4-Way Area
- ③ Fire Control Area
- ④ Tank Area
- ⑤ Grey Scale Area
- ⑥ Magnification Area

00073-00ABV3A

Figure 45. M1A2 SEP CITV Reticle Layout²



00148-00AAV3A

Figure 46. M1A2 SEP CITV Narrow Field-of-view Reticles²

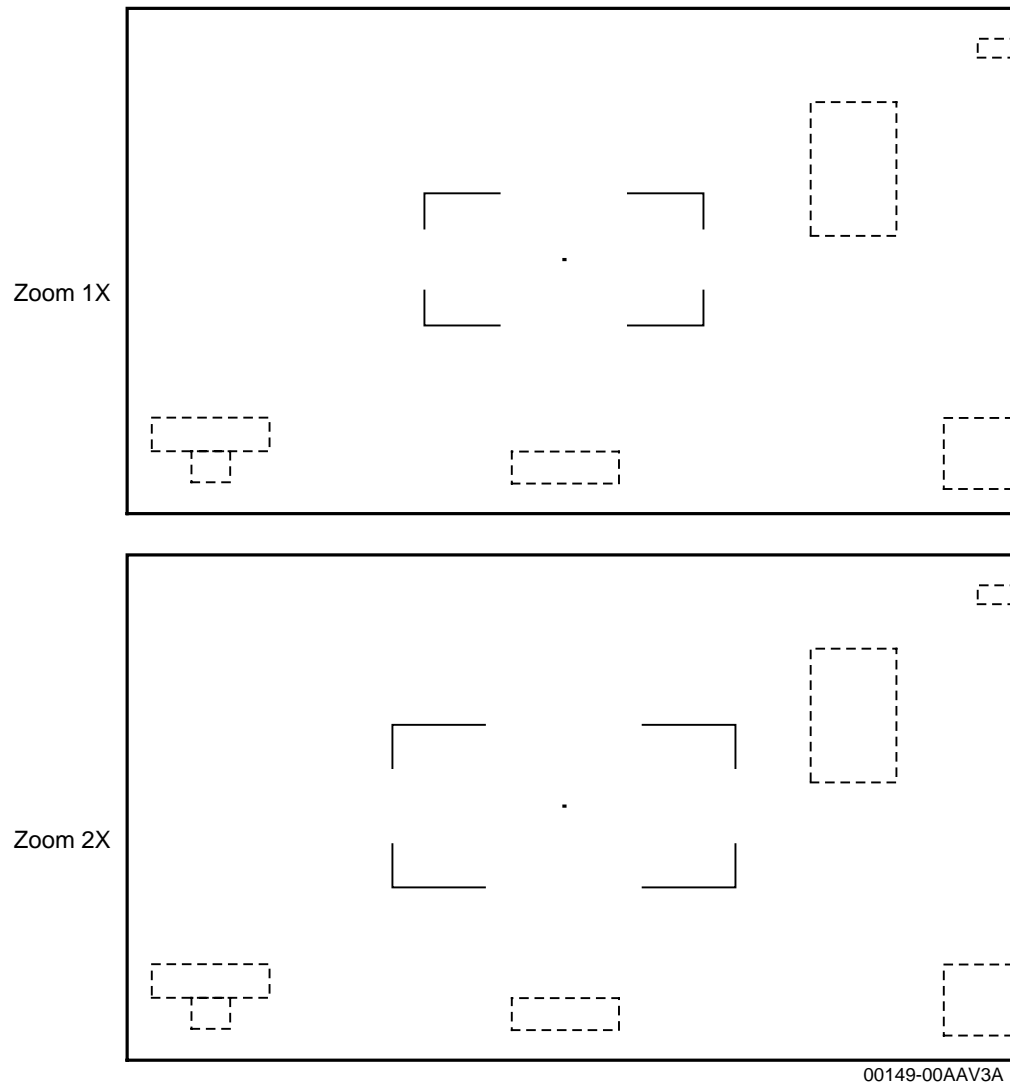
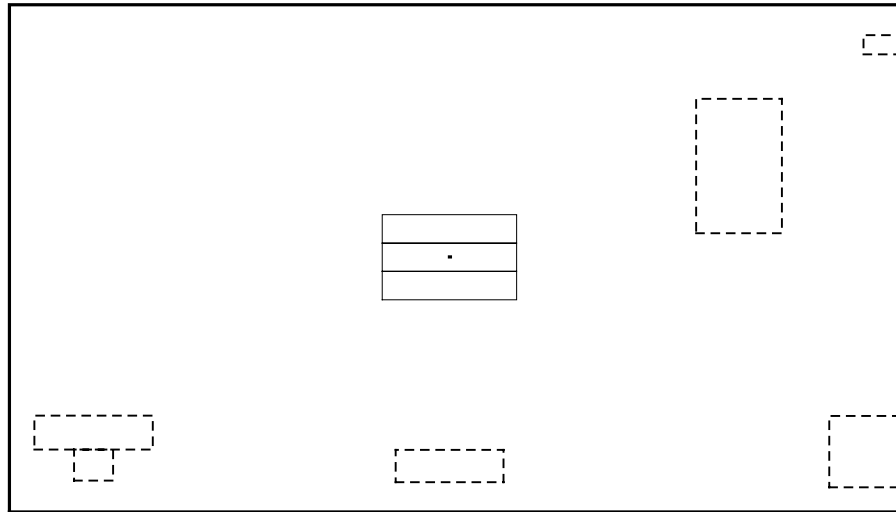
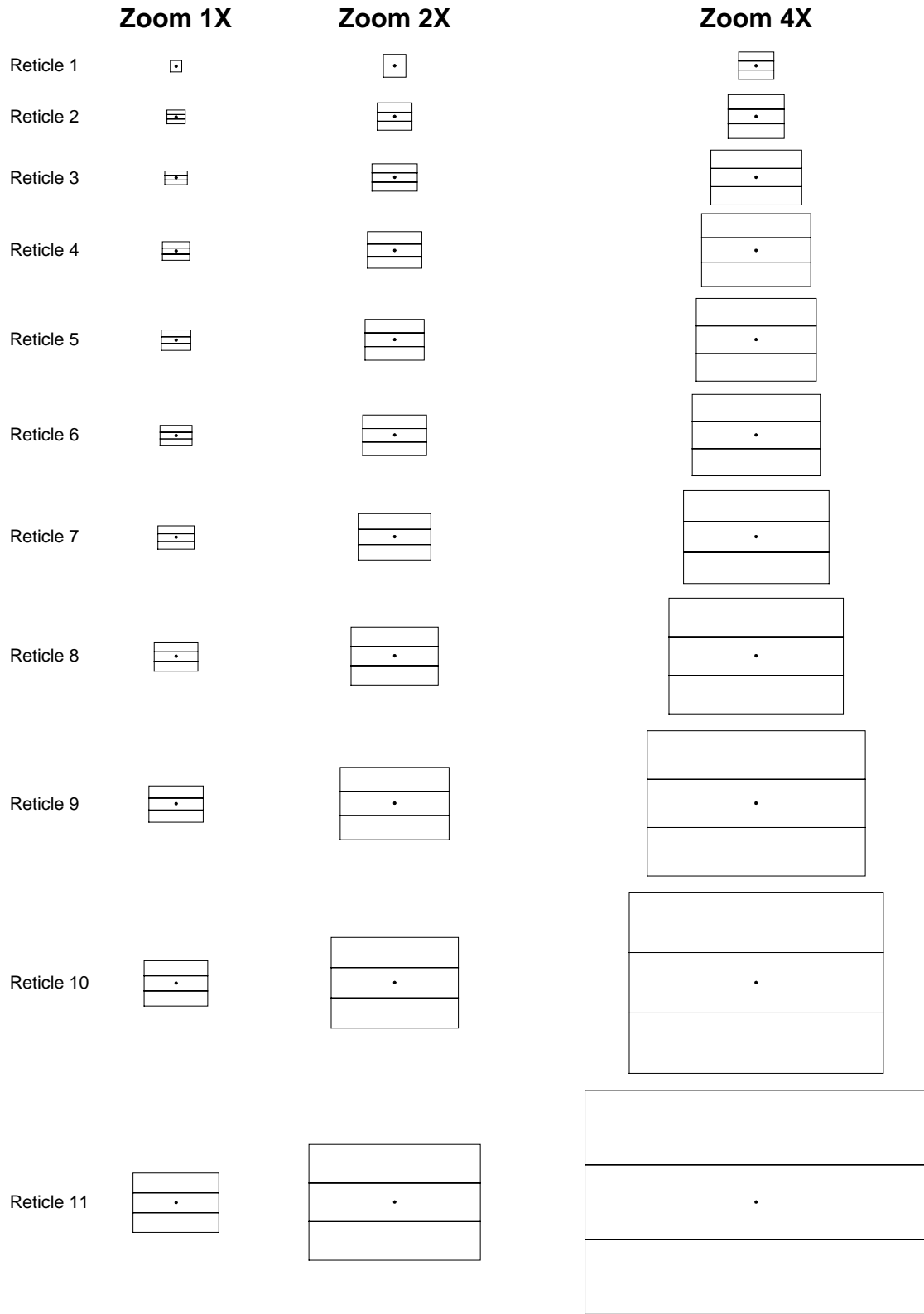


Figure 47. M1A2 SEP CITV Wide Field-of-view Reticles²



00150-00AAV3A

Figure 48. M1A2 SEP CITV Stadia Reticle Example



00080-01ABV2A

Figure 49. M1A2 SEP CITV Stadia Reticles²

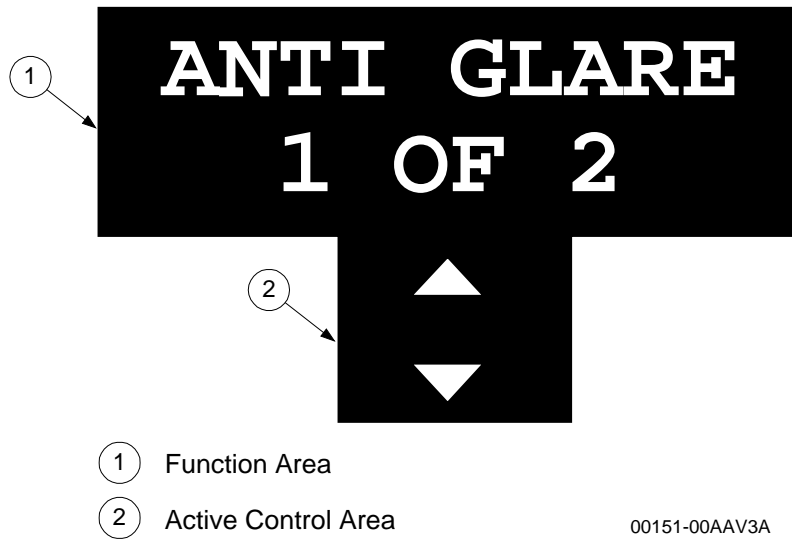
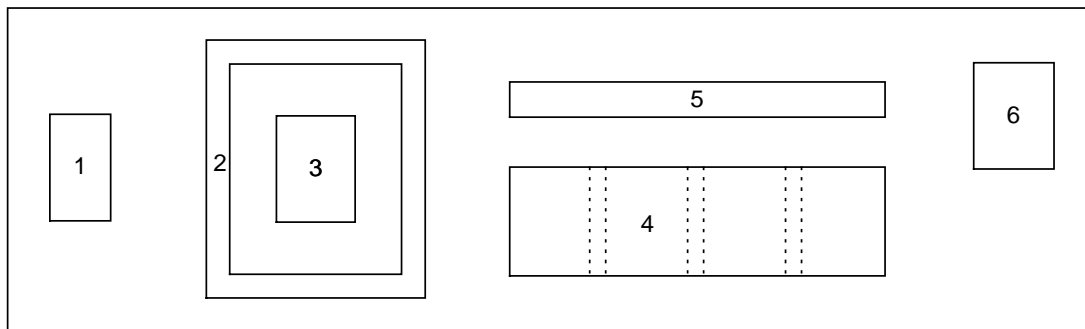
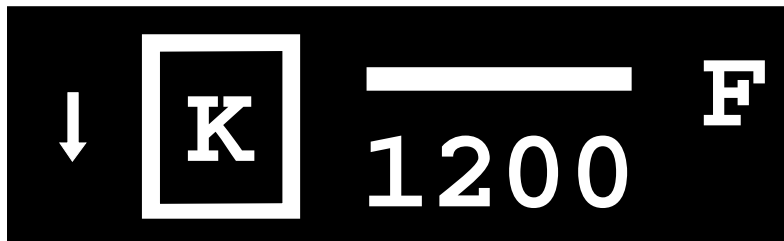


Figure 50. M1A2 SEP CITV Four-way Area Example²

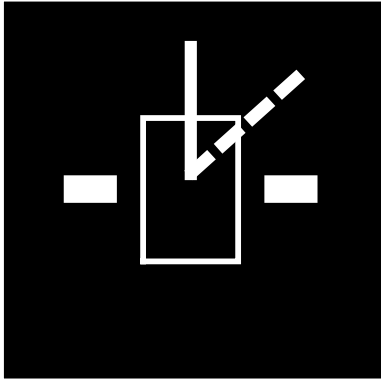


1. Air/Ground Indicator — ↓ or ↑
2. Ready-to-fire Indicator
3. Ammo Selection Indicator — H,K,M,S, or C
4. Laser Range Value Indicator
5. Multiple Return Bar
6. Fire Control Fault Indicator



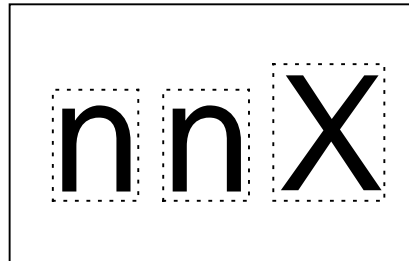
00152-00ABV2A

Figure 51. M1A2 SEP CITV Fire Control Area Layout and Example²



00153-00ABV2A

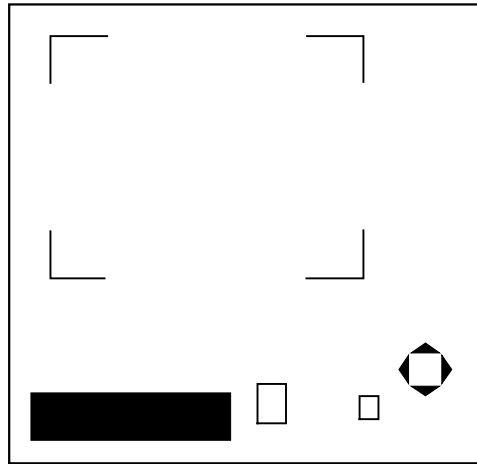
Figure 52. M1A2 SEP CITV Tank Area Example²



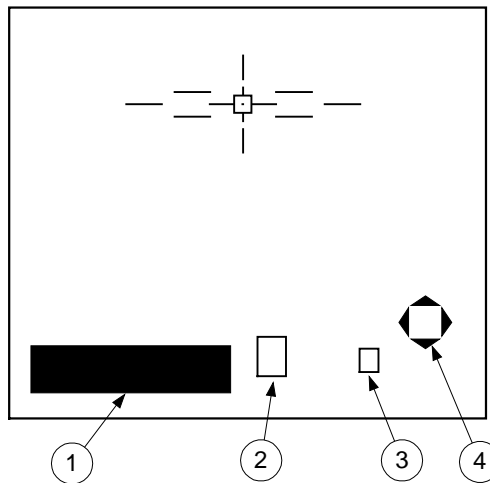
00154-00AAV3A

Figure 53. M1A2 SEP CITV Magnification Area²

With Wide Field of View Reticle



With Narrow Field of View Reticle











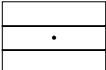


- ① Fire Control Area
- ② Tank Area
- ③ Filter Select Digit
- ④ Four-way Area

00155-00AAV3A

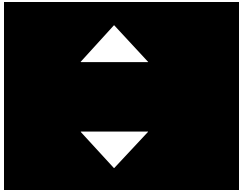
Figure 54. M1A2 LRIP Original CITV Layout²

Zoom 1X

Reticle 1	
Reticle 2	
Reticle 3	
Reticle 4	
Reticle 5	
Reticle 6	
Reticle 7	
Reticle 8	
Reticle 9	
Reticle 10	
Reticle 11	

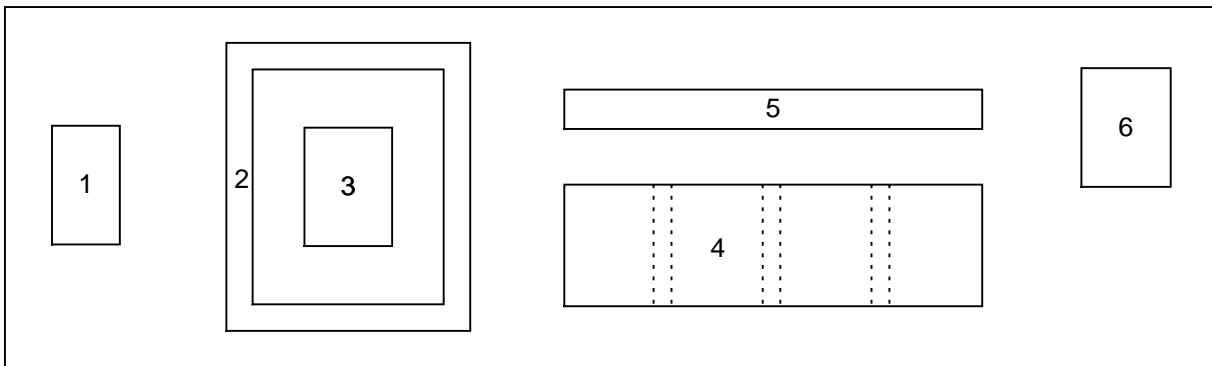
00434-00AAV2A

Figure 55. M1A2 LRIP CITV Stadia Reticles²

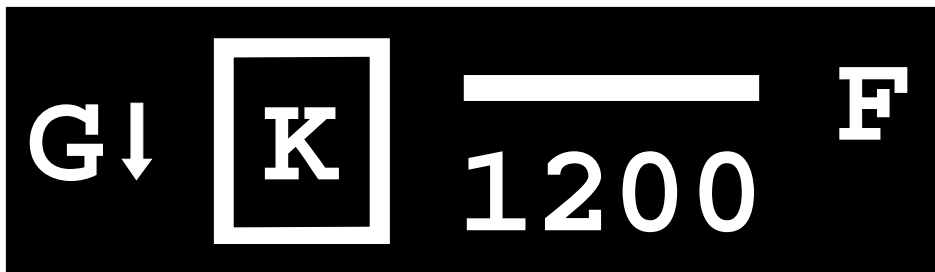


00435-00AAV2A

Figure 56. M1A2 LRIP CITV Four-way Area Example²

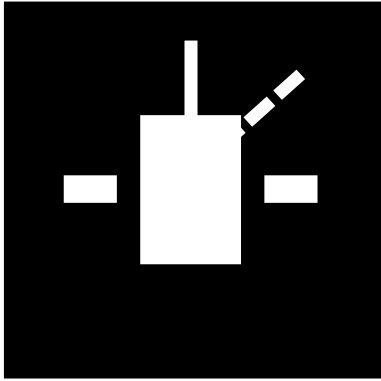


1. Air/Ground Indicator — A↑,G↓
2. Ready-to-fire Indicator
3. Ammo Selection Indicator — H,K,M,S,or C
4. Laser Range Value Indicator
5. Multiple Return Bar
6. Fire Control Fault Indicator



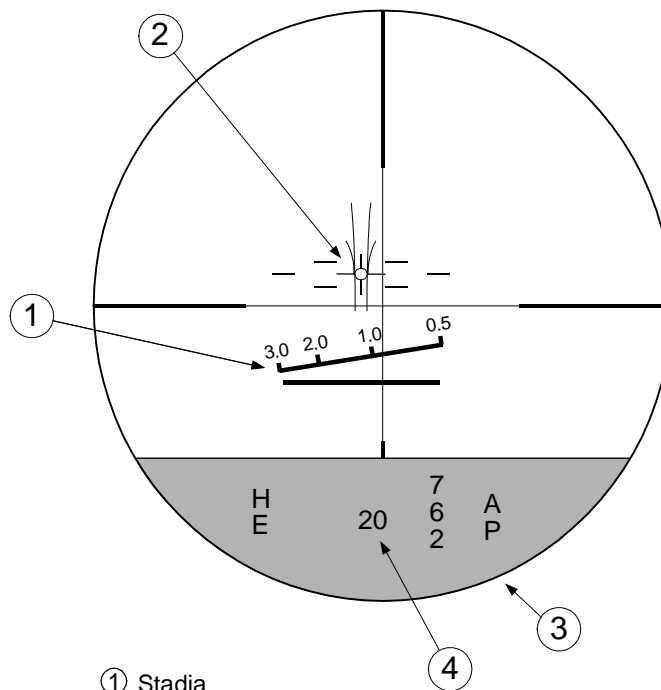
00436-00AAV2A

Figure 57. M1A2 LRIP CITV Fire control Area Layout and Example²



00437-00AAV2A

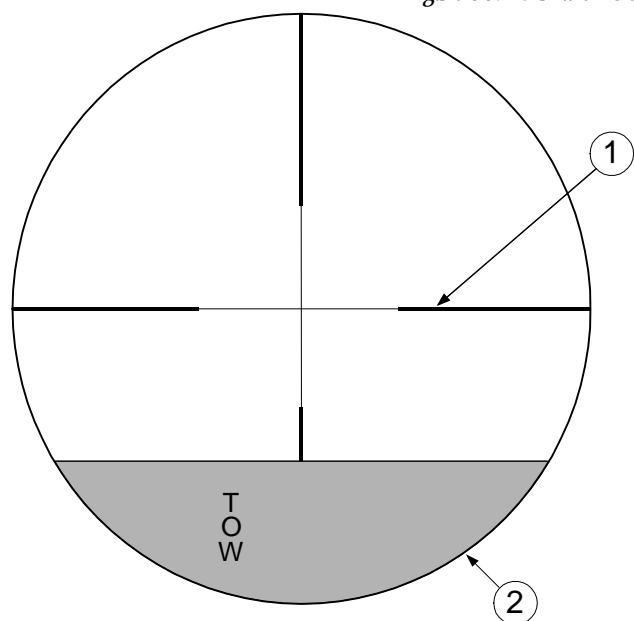
Figure 58. LRIP CITV Tank Area Example²



- ① Stadia
- ② Reticle
- ③ Weapon Selection Indication
- ④ Range

00082-00ACV2A

Figure 59. ISU with Gunlaying Reticle and Stadia²



① TOW Crosshair

② Weapon Selection Indication

00082-01ABV2A

Figure 60. ISU with TOW Crosshair²

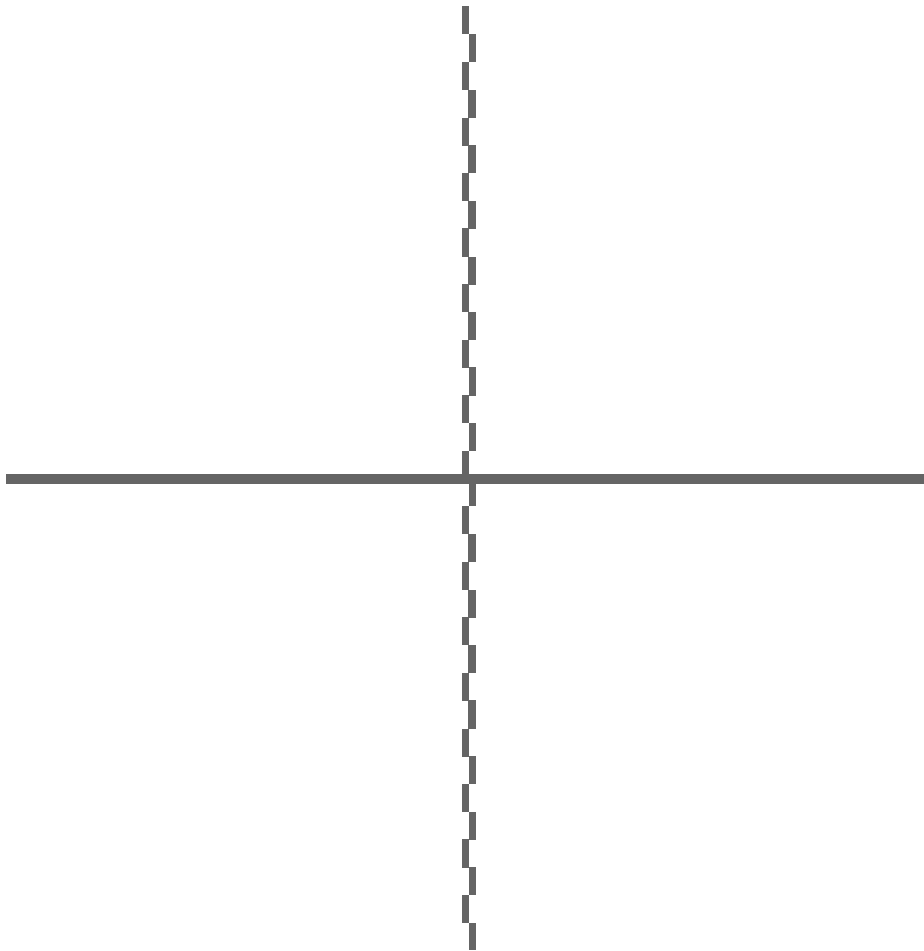


Figure 61. ISU Electronic Alignment²



Figure 62. ISU TOW Test²

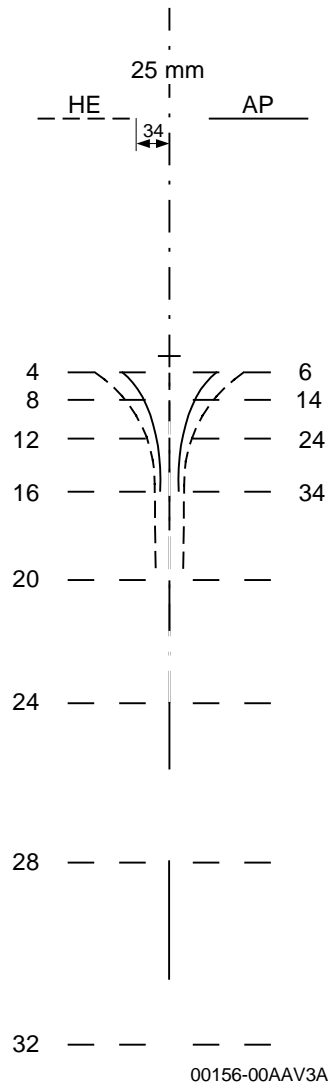


Figure 63. Auxiliary Sight Reticle (Back-up Sight)²

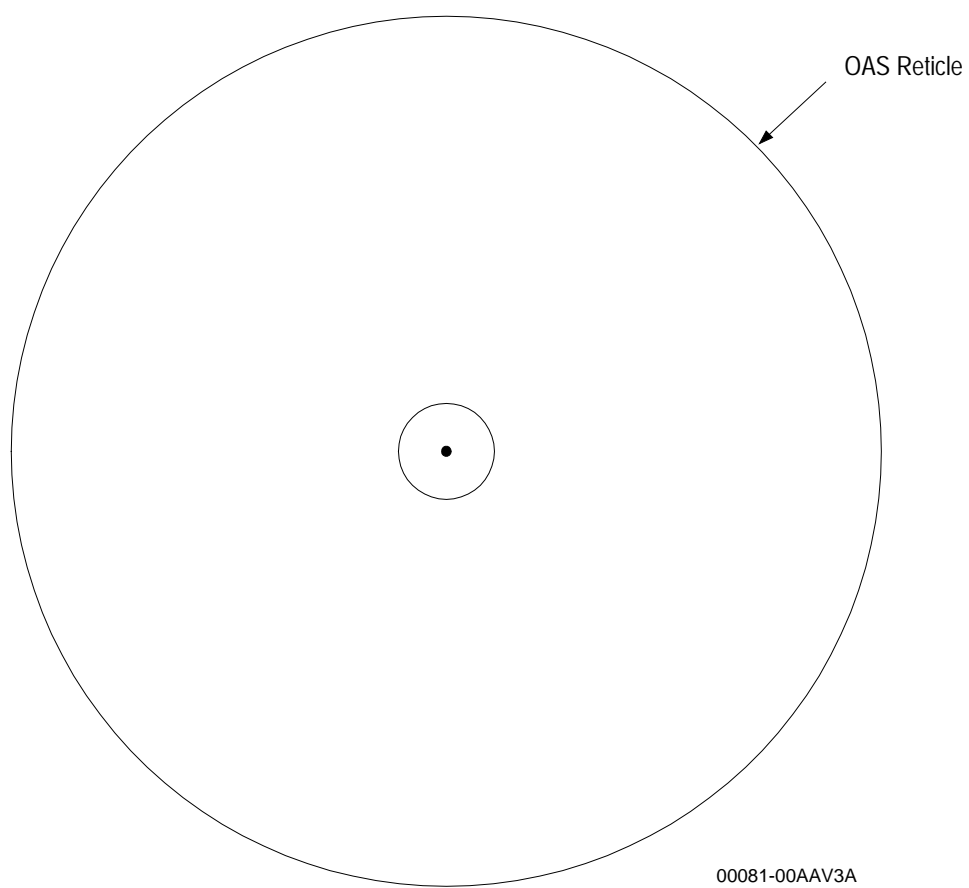
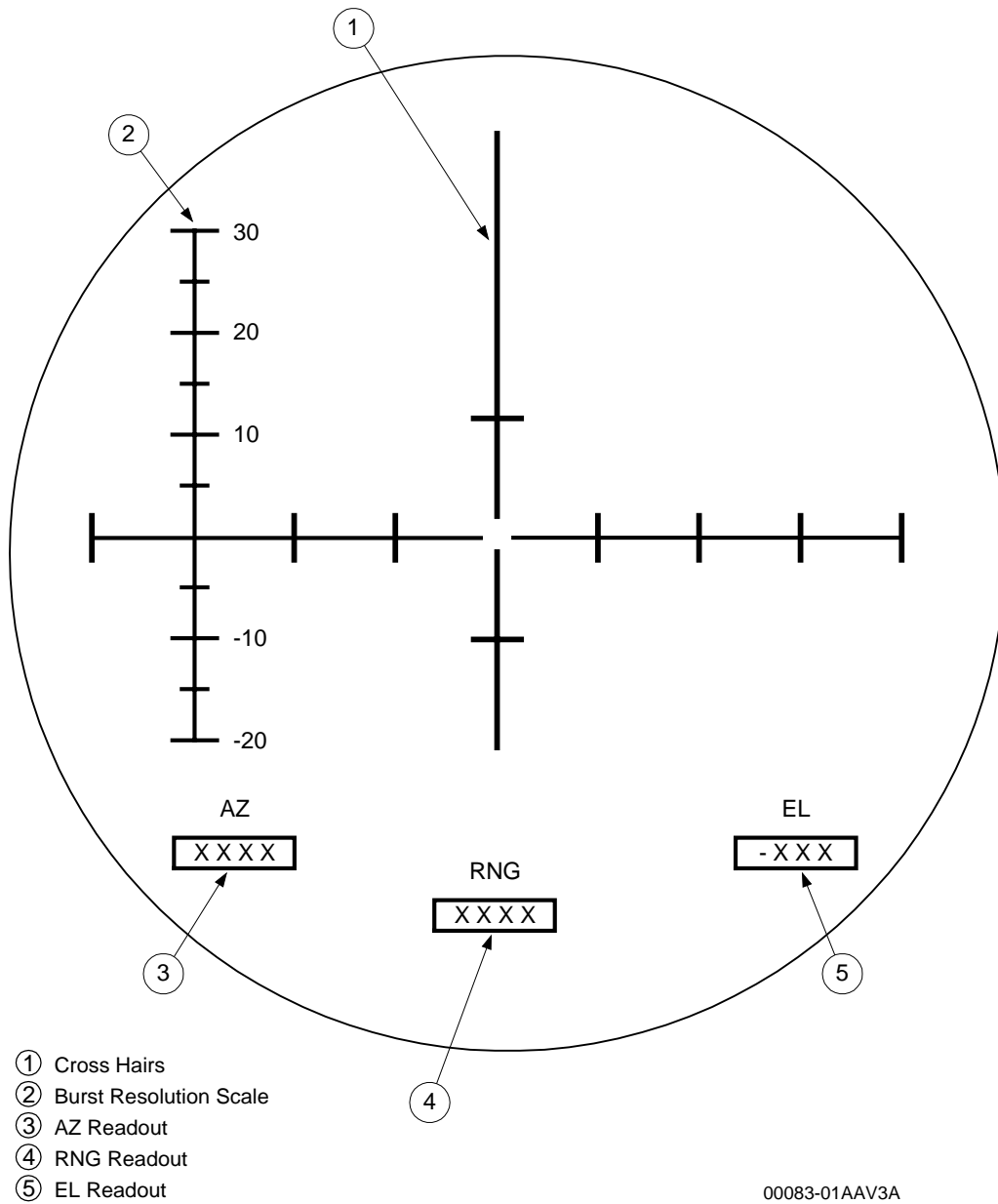
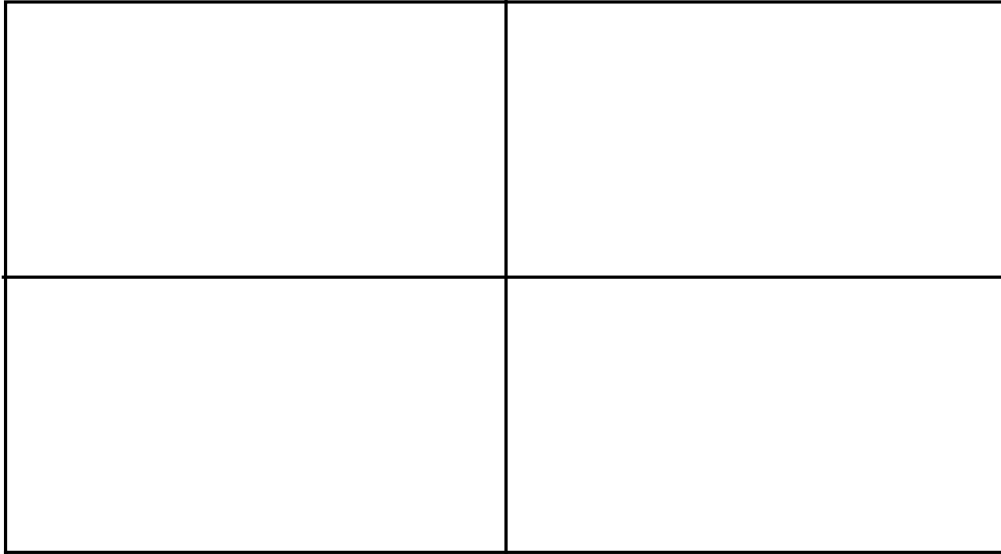


Figure 64. OAS Reticle²



00083-01AAV3A

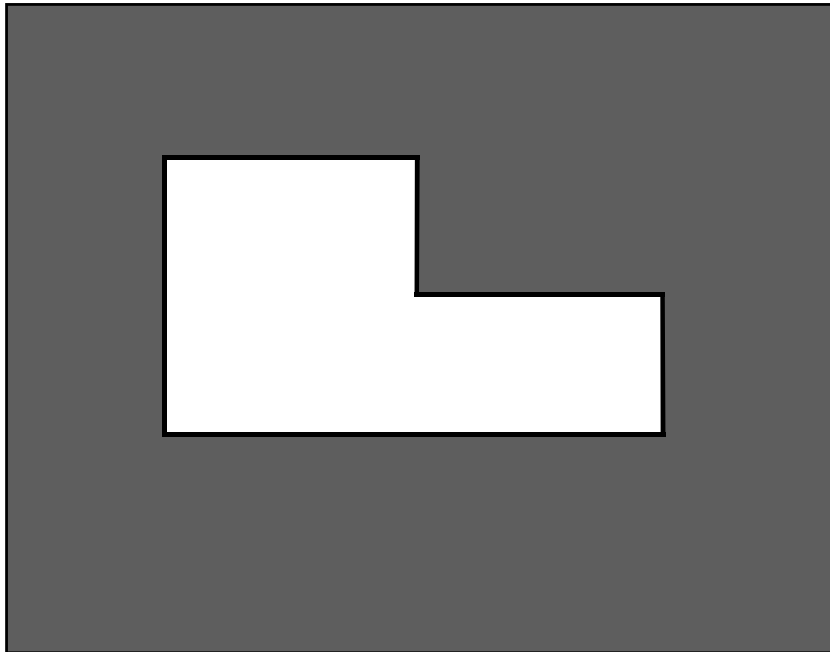
Figure 65. Laser Designator/Range Finder Reticle²



00157-00AAV3A

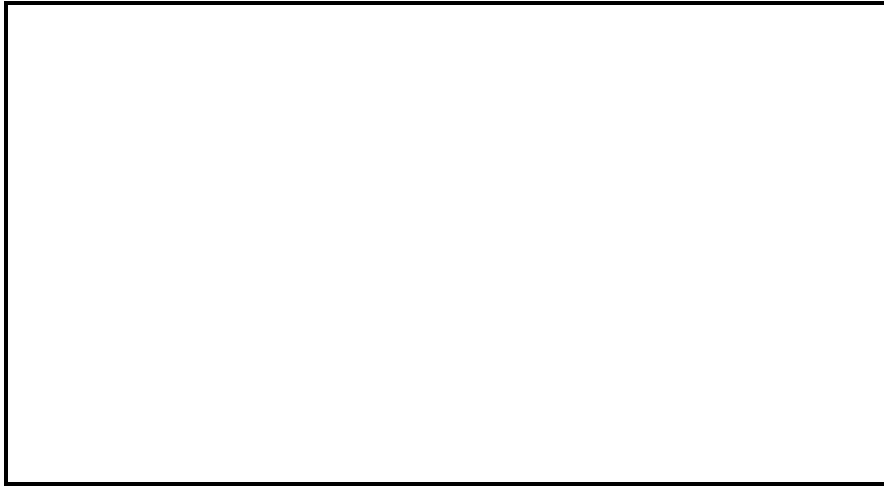
2

Figure 66. TNS Reticle²



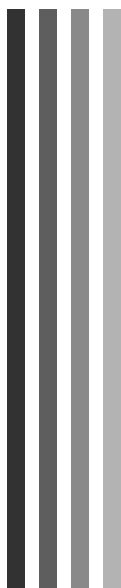
00440-00AAV2A

Figure 67. Bit 0 Test Pattern Mask²



00441-00AAV2A

Figure 68. Bit 1 Test Pattern Mask²



00442-00AAV2A

Figure 69. Bit 2 Test Pattern Mask²

APPENDIX E – PDU ENUMERATION AND BIT-ENCODED VALUES

Point, Linear, and Areal Object State PDU Enumeration and Bit-Encoded Values

A1.0. Point Object State PDU Enumeration and Bit-Encoded Values

A1.1. Force ID

This section specifies the 8-bit enumeration for the Force-ID field in the Point Object State PDU.

- 0 - Other
- 1 - Friendly
- 2 - Opposing
- 3 - Neutral

Object Type record

This section specifies the 32-bit enumeration for the Object-Type record of the Point Object State PDU. The Object Type record is composed of the Domain, Object Kind, Category, and Subcategory. Each of these enumerations is discussed below.

Domain

This section specifies the 8-bit enumeration for the Domain field.

- 0 - Other
- 1 - Land
- 2 - Air
- 3 - Surface
- 4 - Subsurface
- 5 - Space

Object Kind

This section specifies the 8-bit enumeration for the Object Kind field.

- 0 - other
- 1 - obstacle
- 2 - prepared position
- 3 - cultural feature
- 4 - passageway
- 5 - tactical smoke
- 6 - obstacle marker
- 7 - obstacle breach

A1.1.1. Category

The Category field is an 8-bit enumeration. The following Category values are for the indicated Domain and Object Kind.

Domain = Land, Object Kind = Obstacle

-
- 0 - Other
 - 1 - Abatis
 - 2 - Log Crib
 - 3 - Crater

Domain = Land, Object Kind = Prepared Position

-
- 0 - Other
 - 1 - Vehicle Defilade
 - 2 - Infantry Fighting Position

Domain = Land, Object Kind = Cultural Feature

-
- 0 - Other
 - 1 - Building/Structure
 - 2 - Building Rubble

Domain = Other, Object Kind = Passageway

-
- 0 - Other
 - 1 - Stationary Bridge
 - 2 - AVLB
 - 3 - Ribbon Bridge

Domain = Other, Object Kind = Tactical Smoke

-
- 0 - Other
 - 1 - Ground Burst
 - 2 - Air Burst

A1.1.2. Subcategory

The Subcategory field is an 8-bit enumeration which expands on the Category field. The following are the subcategory values for the indicated categories.

Category = Building/Structure

-
- 0 - other
 - 1 - church
 - 2 - apartment building
 - 3 - government building

- 4 - industrial building
- 5 - hangar
- 6 - microwave tower
- 7 - power pylon
- 8 - radio/TV tower
- 9 - school
- 10 - transformer yard

Category = Building Rubble

0 - other

Category = Stationary Bridge, Ribbon Bridge

-
- 0 - other
 - 1 - 2-lane
 - 2 - 4-lane

Category = AVLB

-
- 0 - other
 - 1 - M60A1
 - 2 - MTU20

Category = Abatis

-
- 0 - other
 - 1 - 8 tree
 - 2 - 14 tree

Category = Log Crib

-
- 0 - other
 - 1 - rectangular
 - 2 - triangular

Category = Crater

-
- 0 - other
 - 1 - small
 - 2 - medium
 - 3 - large

Category = Vehicle Defilade

- 0 - other
- 1 - armored vehicle
- 2 - fighting vehicle
- 3 - mortar carrier
- 4 - tank

Category = Infantry Fighting Position

- 0 - other
- 1 - covered machine gun bunker
- 2 - overhead covered infantry position
- 3 - non-covered infantry position
- 4 - non-covered machine gun bunker
- 5 - hasty fighting position

Category = Ground Burst

- 0 - other
- 1 - artillery

Category = Air Burst

- 0 - other
- 1 - grenade

A1.2. Point Object Appearance

This section specifies the 48-bit enumeration for the Appearance record of the Point Object State PDU. This field consists of a general part comprising the lower 16 bits, and a specific part, comprising the upper 32 bits.

A1.2.1. General

The general part of the Appearance field is defined as follows.

<u>Name</u>	<u>Bits</u>	<u>Purpose</u>
<u>% Complete</u>	0-7	8-bit unsigned number indicating the percent completion of the object (0..100)
Damage	8-9	Describes the damaged appearance of the object

		0 - no damage 1 - damaged 2 - destroyed
Predistributed	10	Describes whether the object was predistributed 0 - object created during the exercise 1 - object predistributed prior to exercise start
State	11	Describes the state 0 - Active 1 - Deactivated
Smoking	12	Describes whether smoke is rising from an object 0 - none 1 - smoke present
Flaming	13	Describes whether flames are rising from an object 0 - none 1 - flames present
Unused	14-15	

A1.2.2. Specific

The upper 32 bits of the Point Object Appearance field are defined specifically for each category. The following sections describe the specific bit definitions for all categories.

A1.2.2.1. Building/Building Rubble/Stationary Bridge/AVLB

The upper 32 bits of the Point Object Appearance field for the categories Building, Building Rubble, Stationary Bridge, and AVLB are unused.

A1.2.2.2. Log Crib/Abatis/Vehicle Defilade/Infantry Fighting Position

The upper 32 bits of the Point Object Appearance field for the categories Log Crib, Abatis, Vehicle Defilade, and Infantry Fighting Position are defined as follows:

<u>Name</u>	<u>Bits</u>	<u>Purpose</u>
<u>Breach</u>	0-1	Describes the breached appearance of the object 0 - no breaching 1 - breached 2 - cleared
Unused	2-31	

A1.2.2.3. Air Burst/Ground Burst

The upper 32 bits of the Point Object Appearance field for the categories Air Burst and Ground Burst are defined as follows:

<u>Name</u>	<u>Bits</u>	<u>Purpose</u>
<u>Opacity</u>	0-7	Indicates the percent opacity of the smoke 8-bit unsigned number indicating the percent opacity of the smoke, ranging from 0% opaque to 100% opaque
Size	8-15	8 bit unsigned number indicating the radius of the cylinder which approximates an individual burst. The Point Object Location indicates the center of the bottom of the cylinder for individual bursts. For multiple bursts, the center bottom of each cylinder is calculated based on the model used to represent the multiple bursts.
Height	16-23	8 bit unsigned number indicating the height of the cylinder which approximates an individual burst. The Point Object Location indicates the center of the bottom of the cylinder for individual bursts. For multiple bursts, the center bottom of each cylinder is calculated based on the model used to represent multiple bursts.
Number Bursts	24-29	6 bit unsigned number indicating the number of bursts in the instance of tactical smoke. For CCTT, a tactical smoke instance involving air bursts may be composed of multiple bursts.
Chemical	30-31	Describe the chemical content of the smoke 0 - other 1 - hydrochloric 2 - white phosphorous 3 - red phosphorous

A1.2.2.4. Crater

The upper 32 bits of the Point Object Appearance field for the Crater category are defined as follows:

<u>Name</u>	<u>Bits</u>	<u>Purpose</u>
<u>Size</u>	0-7	8-bit unsigned number indicating the diameter of the crater, where the center of the crater is at Point Object Location.
Unused	8-31	

A1.2.2.5. Ribbon Bridge

The upper 32 bits of the Point Object Appearance field for the Ribbon Bridge category are defined as follows:

<u>Name</u>	<u>Bits</u>	<u>Purpose</u>
<u>Number Segments</u>	0-7	8-bit unsigned number indicating the number of segments composing the ribbon bridge.

A1.3. Point Object Modifications

This section specifies the 8-bit enumeration for the Modifications record of the Point Object State PDU. The bits are defined as follows:

<u>Name</u>	<u>Bits</u>	<u>Purpose</u>
<u>Location</u>	0	Describes whether the point object location has been modified since the last update number. 0 - location has not been modified 1 - location has been modified
Orientation	1	Describes whether the point object orientation has been modified since the last update number. 0 - orientation has not been modified 1 - orientation has been modified
Unused	2-7	

A2.0. Linear Object State PDU Enumeration and Bit-Encoded Values

A2.1. Force ID

Same as Point Object State PDU, see Section A1.1

A2.2. Object Type record

Same as Point Object State PDU, see Section 0

A2.2.1. Domain

Same as Point Object State PDU, see Section 0.

A2.2.2. Object Kind

Same as Point Object State PDU, see Section 0

A2.2.3. Category

The Category field is an 8-bit enumeration. The following Category values are for the indicated Domain and Object Kind.

Domain = Land, Object Kind = Obstacle

0 - Other
1 - Tank Ditch
2 - Concertina Wire

Domain = Other, Object Kind = Tactical Smoke

0 - Other
1 - Exhaust Smoke

Domain = Land, Object Kind = Obstacle Marker

0 - Other
1 - Minefield Lane Marker

Domain = Land, Object Kind = Obstacle Breach

0 - Other
1 - Breach

A2.2.4. Subcategory

The Subcategory field is an 8-bit enumeration which expands on the Category field. The following are the subcategory values for the indicated categories.

Category = Tank Ditch

0 - other

Category = Concertina Wire

0 - other
1 - 2-roll
2 - 3-roll

Category = Exhaust Smoke

0 - other

Category = Minefield Lane Marker

0 - other

Category = Breach

0 - other

A2.3. Linear Object Appearance

This section specifies the 48-bit enumeration for the Appearance record of the Linear Object State PDU. This field consists of a general part comprising the lower 16 bits, and a specific part, comprising the upper 32 bits. Note that a Linear Object is composed of segments, and there is an appearance field for each segment.

A2.3.1. General

Same as Point Object State PDU. See Section A1.2.1

A2.3.2. Specific

The upper 32 bits of the Linear Object Appearance field are defined specifically for each category. The following sections describe the specific bit definitions for all categories.

A2.3.2.1. Tank Ditch/Concertina Wire

The upper 32 bits of the Linear Object Appearance field for the categories Tank Ditch and Concertina Wire are defined as follows:

<u>Name</u>	<u>Bits</u>	<u>Purpose</u>
<u>Breach</u>	0-1	Describes the breached appearance of the object 0 - no breaching 1 - slight breaching 2 - moderate breaching 3 - cleared
Breach Length	16-23	8-bit unsigned number indicating the fixed length of a breached segment. The 8 bits which follow indicate whether a segment of length Breach Length is breached or not. An example follows.
Breach Locations	24-31	Each bit indicates whether its associated segment is breached or not. Bit 24+i indicates whether the portion of the segment beginning at The segment origin + (i*Breach Length) and extending i*Breach Length meters is breached or not. For each bit: 0 - associated portion of segment is not breached 1 - associated portion of segment is breached

Example of use of Breach Length and Breach Locations:

Let Breach Length = 30 meters

Let Breach Locations = 00000101

Let Object Location = (0.0, 0.0) and extend 120 meters to (120.0, 0.0).

Then, as indicated by Breach Locations, the segment from (0.0, 0.0) to (30.0, 0.0) is breached and the segment from (60.0, 0.0) to (90.0, 0.0) is also breached.

A2.3.2.2. Exhaust Smoke

The upper 32 bits of the Linear Object Appearance field for the Exhaust Smoke category is defined as follows:

<u>Name</u>	<u>Bits</u>	<u>Purpose</u>
<u>Opacity</u>	0-7	Indicates the percent opacity of the smoke 8-bit unsigned number indicating the percent opacity of the smoke, ranging from 0% opaque to 100% opaque
Attached	8	Describes whether the smoke is attached to the vehicle 0 - not attached 1 - attached
Chemical	9-10	Describe the chemical content of the smoke 0 - other 1 - hydrochloric 2 - white phosphorous 3 - red phosphorous
Unused	11-31	

A2.3.2.3. Minefield Lane Marker

The upper 32 bits of the Linear Object Appearance field for the Minefield Lane Marker category is defined as follows:

<u>Name</u>	<u>Bits</u>	<u>Purpose</u>
<u>Visible Side</u>	0-1	Describes the side of the lane marker which is visible 0 - left hand side is visible 1 - right hand side is visible 2 - both sides visible
Unused	2-31	

A2.3.2.4. Breach

The upper 32 bits of the Linear Object Appearance field for the Breach category are unused.

A2.4. Linear Segment Modifications

This section specifies the 8-bit enumeration for the Segment Modifications record of the Linear Object State PDU. The bits are defined as follows:

<u>Name</u>	<u>Bits</u>	<u>Purpose</u>
<u>Location</u>	0	Describes whether the linear segment's location has been modified since the last update number. 0 - location has not been modified 1 - location has been modified
Orientation	1	Describes whether the linear segment's orientation has been modified since the last update number. 0 - orientation has not been modified 1 - orientation has been modified
Unused	2-7	

A3.0. Areal Object State PDU Enumeration and Bit-Encoded Values

A3.1. Force ID

Same as Point Object State PDU, see Section A1.1

A3.2. Object Type record

Same as Point Object State PDU, see Section 0

A3.2.1. Domain

Same as Point Object State PDU, see Section 0

A3.2.2. Object Kind

Same as Point Object State PDU, see Section 0

A3.2.3. Category

The Category field is an 8-bit enumeration. The following Category values are for the indicated Domain and Object Kind.

Domain = All, Object Kind = All

0 - Other

Domain = Land, Object Kind = Obstacle

0 - Other
1 - Minefield

A3.2.4. Subcategory

The Subcategory field is an 8-bit enumeration which expands on the Category field. The following are the subcategory values for the indicated categories.

Category = Minefield

-
- 0 - other
 - 1 - hasty
 - 2 - prepared
 - 3 - scattered
 - 4 - solitary

A3.3. Areal Object Appearance

This section specifies the 48-bit enumeration for the Appearance record of the Areal Object State PDU. This field consists of a general part comprising the lower 16 bits, and a specific part, comprising the upper 32 bits.

A3.3.1. General

Same as Point Object State PDU. See Section A1.2.1

A3.3.2. Specific

The upper 32 bits of the Areal Object Appearance field are defined specifically for each category. The following sections describe the specific bit definitions for all categories.

A3.3.2.1. Minefield

The upper 32 bits of the Areal Object Appearance field for the Minefield category is defined as follows:

<u>Name</u>	<u>Bits</u>	<u>Purpose</u>
<u>Breach</u>	0-1	Describes the breached appearance of the object 0 - no breaching 1 - breached 2 - cleared
Unused	2-14	
Mine Count	15-31	16-bit unsigned number indicating the number of mines in the minefield.

A3.4. Areal Object Modifications

This section specifies the 8-bit enumeration for the Modifications record of the Areal Object State PDU. The bits are defined as follows:

<u>Name</u>	<u>Bits</u>	<u>Purpose</u>
<u>Location</u>	0	Describes whether any of the areal object's point locations have

been modified since the last update number.
0 - no locations have been modified
1 - locations have been modified

UNUSED 1-7

APPENDIX E – TRANSITION TABLES

The BLUFOR and OPFOR Transition Tables provide the necessary conditions for a combat unit to divert from its current CIS to a situational interrupt CIS. Since the determination as to whether to perform a situational interrupt CIS largely depends on the CIS that the unit is currently performing, there is a different transition table for each CIS or type of CIS (formation, movement, etc.). The name of each table indicates the CIS or type of CIS that the specified unit is currently performing.

The names of the situational interrupt CISs for the specified unit are horizontally labeled in the table. There may be several columns located below the name of each situational interrupt CIS. Each of these columns indicate a separate condition in which the unit may transition to the situational interrupt CIS. Therefore, to determine one condition in which the unit would perform the situational interrupt CIS, one would extract all the vertically labeled parameters that are marked with an "x" in a single column.

For example, using the BLUFOR Company Team Transitions from B1101 Perform Tactical Movement table (Table II-C-I.), the first column under the B1104 Perform Actions on Contact situational interrupt CIS shows that the parameter "Receiving Ground Fire" is marked with an "x." This indicates that one of the conditions for executing the Perform Actions on Contact CIS is that the BLUFOR Company Team receives ground fire while executing a Perform Tactical Movement CIS.

1. BLUFOR TRANSITION TABLES

The BLUFOR Transition Tables are included in the following:

- Table 5. **BLUFOR Company Team Transitions from B1101 Perform Tactical Movement**
- Table 6. **BLUFOR Company Team Transitions from B1102 Perform Tactical Road March**
- Table 7. **BLUFOR Company Team Transitions from B1104 Perform Actions on Contact**
- Table 8. **BLUFOR Company Team Transitions from B1105 Assault An Enemy Position (Mounted)**
- Table 9. **BLUFOR Company Team Transitions from B1108 Perform Attack Position Actions**
- Table 10. **BLUFOR Company Team Transitions from B1111 Consolidate on the Objective**
- Table 11. **BLUFOR Company Team Transitions from B1112 Reorganize on the Objective**
- Table 12. **BLUFOR Mechanized Platoon Transitions from B0101 Execute Column Formation**
- Table 13. **BLUFOR Mechanized Platoon Transitions from B0102 Execute Line Formation**

- Table 14. **BLUFOR Mechanized Platoon Transitions from B0104 Execute Wedge Formation**
- Table 15. **BLUFOR Mechanized Platoon Transitions from B0105 Execute Herringbone Formation**
- Table 16. **BLUFOR Mechanized Platoon Transitions from B0109 Execute Bounding Overwatch**
- Table 17. **BLUFOR Mechanized Platoon Transitions from B0110 Execute Action Right**
- Table 18. **BLUFOR Mechanized Platoon Transitions from B0112 React to Indirect Fire**
- Table 19. **BLUFOR Mechanized Platoon Transitions from B0115 Execute Hasty Dismount**
- Table 20. **BLUFOR Mechanized Platoon Transitions from B0116 Mount Vehicle**
- Table 21. **BLUFOR Mechanized Platoon Transitions from B0118 Conduct Tactical Road March**
- Table 22. **BLUFOR Mechanized Platoon Transitions from B0123 Assault Mounted**
- Table 23. **BLUFOR Mechanized Platoon Transitions from B0125 Consolidate and Reorganize**
- Table 24. **BLUFOR Mechanized Platoon Transitions from B0155 React to Contact (Mounted)**
- Table 25. **BLUFOR Tank Platoon Transitions from B0002 Execute Staggered Column Formation**
- Table 26. **BLUFOR Tank Platoon Transitions from B0003 Execute Wedge Formation**
- Table 27. **BLUFOR Tank Platoon Transitions from B0004 Execute Line Formation**
- Table 28. **BLUFOR Tank Platoon Transitions from B0008 Execute Herringbone Formation**
- Table 29. **BLUFOR Tank Platoon Transitions from B0009 Execute Action Drill (Front)**
- Table 30. **BLUFOR Tank Platoon Transitions from B0010 Execute Action Drill (Right)**
- Table 31. **BLUFOR Tank Platoon Transitions from B0011 Execute Action Drill (Left)**
- Table 32. **BLUFOR Tank Platoon Transitions from B0012 Execute Action Drill (Rear)**
- Table 33. **BLUFOR Tank Platoon Transitions from B0013 React to Indirect Fires**

- Table 34. **BLUFOR Tank Platoon Transitions from B0015 Execute Traveling**
- Table 35. **BLUFOR Tank Platoon Transitions from B0016 Execute Bounding Overwatch**
- Table 36. **BLUFOR Tank Platoon Transitions from B0018 Perform Assembly Area Activities**
- Table 37. **BLUFOR Tank Platoon Transitions from B0021 Conduct Tactical Road March**
- Table 38. **BLUFOR Tank Platoon Transitions from B0022 Execute Actions on Contact**
- Table 39. **BLUFOR Tank Platoon Transitions from B0026 Occupy Platoon Battle Position**
- Table 40. **BLUFOR Tank Platoon Transitions from B0029 Consolidate and Reorganize**
- Table 41. **BLUFOR Tank Platoon Transitions from B0030 Perform Platoon Fire and Movement**
- Table 42. **_BLUFOR Tank Platoon Transitions from B0031 Assault Enemy Position**
- Table 43. **BLUFOR Tank Platoon Transitions from B0032 Execute Platoon Defensive Mission**
- Table 44. **BLUFOR Tank Platoon Transitions from B0034 Displace to Subsequent Battle Position**
- Table 45. **BLUFOR Tank Platoon Transitions from B0041 Perform Resupply Operations**
- Table 46. **BLUFOR M109A5 Artillery Platoon Transitions from B0602 Perform Preparation For Movement**
- Table 47. **BLUFOR M109A5 Artillery Platoon Transitions from B0603 Conduct Tactical Movement**
- Table 48. **BLUFOR M109A5 Artillery Platoon Transitions from B0604 Conduct Occupation of Position Area**
- Table 49. **BLUFOR M109A5 Artillery Platoon Transitions from B0605 Establish a Firing Capability**
- Table 50. **BLUFOR M109A5 Artillery Platoon Transitions from B0606 Defend and Secure Platoon Area and Material**
- Table 51. **BLUFOR M109A5 Artillery Platoon Transitions from B0607 Use Active AD Measures**
- Table 52. **BLUFOR M109A5 Artillery Platoon Transitions from B0608 Sustain**
- Table 53. **BLUFOR M109A6 Artillery Platoon Transitions from B0652 Perform Prep For Movement**

- Table 54. **BLUFOR M109A6 Artillery Platoon Transitions from B0653 Conduct Tactical Movement**
- Table 55. **BLUFOR M109A6 Artillery Platoon Transitions from B0654 Conduct Occupation of Position Area**
- Table 56. **BLUFOR M109A6 Artillery Platoon Transitions from B0655 Establish a Firing Capability**
- Table 57. **BLUFOR M109A6 Artillery Platoon Transitions from B0656 Defend and Secure Platoon Area and Material**
- Table 58. **BLUFOR M109A6 Artillery Platoon Transitions from B0657 Use Active AD Measures**
- Table 59. **BLUFOR M109A6 Artillery Platoon Transitions from B0658 Sustain**
- Table 60. **BLUFOR MLRS Artillery Platoon Transitions from B2801 Conduct Tactical Road March**
- Table 61. **BLUFOR MLRS Artillery Platoon Transitions from B2802 Occupy Position**
- Table 62. **BLUFOR MLRS Artillery Platoon Transitions from B2803 Defend and Secure Platoon Area and Material**
- Table 63. **BLUFOR MLRS Artillery Platoon Transitions from B2804 Sustain**
- Table 64. **BLUFOR MLRS Battery Headquarters Transitions from B2902 Occupy Position**
- Table 65. **BLUFOR MLRS Battery Headquarters Transitions from B2903 Defend and Secure Battery Area and Materials**
- Table 66. **BLUFOR Mortar Platoon and Section Transitions from B0401 Operate by Split Platoon / Section**
- Table 67. **BLUFOR Mortar Platoon and Section Transitions from B0402 Occupy Firing Position**
- Table 68. **BLUFOR Mortar Platoon and Section Transitions from B0403 Conduct Tactical Road March**
- Table 69. **BLUFOR Mortar Platoon and Section Transitions from B0405 Occupy Assembly Area**
- Table 70. **BLUFOR Mortar Platoon and Section Transitions from B0406 Defend Against Ground Attack**
- Table 71. **BLUFOR Mortar Platoon and Section Transitions from B0407 React To Air Attack**
- Table 72. **BLUFOR Mortar Platoon and Section Transitions from B0411 Defend Against Indirect Fire**

- Table 73. **BLUFOR Support Platoon Transitions from B1801 Perform Assembly Area Activities**
- Table 74. **BLUFOR Support Platoon Transitions from B1802 Conduct A Convoy Movement**
- Table 75. **BLUFOR Support Platoon Transitions from B1803 Defend Against Ground Ambush, Road Not Blocked**
- Table 76. **BLUFOR Support Platoon Transitions from B1804 Defend Against Ground Ambush (Road Blocked)**
- Table 77. **BLUFOR Support Platoon Transitions from B1805 Secure and Defend Unit Position**
- Table 78. **BLUFOR Support Platoon Transitions from B1806 Use Active AD Measures**
- Table 79. **BLUFOR Support Platoon Transitions from B1807 Occupy Covered and Concealed Positions**
- Table 80. **BLUFOR Maintenance Platoon Transitions from B1901 Plan and Conduct A Convoy**
- Table 81. **BLUFOR Maintenance Platoon Transitions from B1902 Secure and Defend Unit Position**
- Table 82. **_BLUFOR Maintenance Platoon Transitions from B1903 Use Active AD Measures**
- Table 83. **BLUFOR Maintenance Platoon Transitions from B1904 Occupy Assembly Area**
- Table 84. **BLUFOR Maintenance Platoon Transitions from B1905 Select and Establish UMCP or Field Maintenance Sites (Occupy Position)**
- Table 85. **BLUFOR Battalion Task Force Headquarters Transitions from B2501 Move a Command Post**
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- Table 87. **_BLUFOR Combat Engineering Support Unit Transitions from B0901 Move Mounted**
- Table 88. **BLUFOR Combat Engineering Support Unit Transitions from B0902 Secure at Halt**
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- Table 91. **_BLUFOR Combat Engineering Support Unit Transitions from B0905 Use Active AD Measures**
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- Table 94. **BLUFOR Combat Engineering Support Unit Transitions from B0908 Secure and Defend Unit Position**
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- Table 96. **BLUFOR Tank Platoon Transitions from B0001 Execute Column Formation**
- Table 97. **BLUFOR Tank Platoon Transitions from B0006 Execute Vee Formation**
- Table 98. **BLUFOR Tank Platoon Transitions from B0012 EXECUTE ACTION DRILL (REAR)**
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- Table 100. **BLUFOR Tank Platoon Transitions from B0017 Execute Traveling Overwatch**
- Table 101. **BLUFOR Tank Platoon Transitions from B0024 Attack By Fire**
- Table 102. **BLUFOR Tank Platoon Transitions from B0025 Conduct Hasty Occupation of a Battle Position**
- Table 103. **BLUFOR Tank Platoon Transitions from B0033 React To Dismounted Attack**
- Table 104. **BLUFOR Tank Platoon Transitions from B0036 Take Actions At An Obstacle**
- Table 105. **BLUFOR Mechanized Platoon Transitions from B0107 Execute Traveling**
- Table 106. **BLUFOR Mechanized Platoon Transitions from B0108 Execute Traveling Overwatch**
- Table 107. **BLUFOR Mechanized Platoon Transitions from B0109 Execute Bounding Overwatch**
- Table 108. **BLUFOR Mechanized Platoon Transitions from B0111 Execute Action Left**
- Table 109. **BLUFOR Mechanized Platoon Transitions from B0117, Occupy Assembly Area**

- Table 110. **BLUFOR Mechanized Platoon Transitions from B0119 REACT TO DIRECT FIRE/ATGM**
- Table 111. **BLUFOR Mechanized Platoon Transitions from B0120 Support by Fire**
- Table 112. **BLUFOR Mechanized Platoon Transitions from B0121 Fire and Movement**
- Table 113. **BLUFOR Mechanized Platoon Transitions from B0122 BREACH OBSTACLE**
- Table 114. **BLUFOR Mechanized Platoon Transitions from B0126 Establish Hasty Position**
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- Table 116. **BLUFOR Mechanized Platoon Transitions from B0129 Disengage Mounted**
- Table 117. **BLUFOR Mechanized Platoon Transitions from B0134 CROSS DEFILE**
- Table 118. **BLUFOR Mechanized Platoon Transitions from B0135 Clear Wood Line**
- Table 119. **BLUFOR Mechanized Platoon Transitions from B0137 Emplace Hasty Protective Minefield**
- Table 120. **BLUFOR Mechanized Platoon Transitions from B0143 Conduct Screen/Guard Operations**
- Table 121. **BLUFOR Mechanized Platoon Transitions from B0144 Move Dismounted (Traveling and Traveling Overwatch)**
- Table 122. **BLUFOR Mechanized Platoon Transitions from B0145 Cross Danger Area (Dismounted)**
- Table 123. **BLUFOR Mechanized Platoon Transitions from B0146 React To Contact (Dismounted)**
- Table 124. **BLUFOR Mechanized Platoon Transitions from B0149 Disengage Dismounted**
- Table 125. **BLUFOR Mechanized Platoon Transitions from B0152 Sustain**
- Table 126. **BLUFOR Mechanized Platoon Transitions from B0154 Move Dismounted (Bounding Overwatch)**
- Table 127. **BLUFOR Mechanized Platoon Transitions from B0156 Take Actions At Obstacle**
- Table 128. **BLUFOR Scout Platoon Transitions from B0301 Perform a Tactical Road March**
- Table 129. **BLUFOR Scout Platoon Transitions from B0302 Occupy Assembly Area**
- Table 130. **BLUFOR Scout Platoon Transitions from B0305 React To Indirect Fires**

- Table 131. **BLUFOR Scout Platoon Transitions from B0308 Conduct Bounding Overwatch**
- Table 132. **BLUFOR Scout Platoon Transitions from B0310 Perform A Zone Reconnaissance**
- Table 133. **BLUFOR Scout Platoon Transitions from B0313 EXECUTE ACTIONS ON CONTACT**
- Table 134. **BLUFOR Scout Platoon Transitions from B0315 Conduct A Screen**
- Table 135. **BLUFOR Scout Platoon Transitions from B0318 Perform Resupply Operations**
- Table 136. **BLUFOR Scout Platoon Transitions from B0321 Take Active Air Defense Measures While Moving**
- Table 137. **_BLUFOR Air Defense Artillery Platoon Transitions from B0808 Travel to and Occupy the NDP**
- Table 138. **BLUFOR Company Team Transitions from B1106 Occupy Assembly Area**
- Table 139. **BLUFOR Company Team Transitions from B1107 Perform Assault Position Activities**
- Table 140. **BLUFOR Company Team Transitions from B1116 Execute Action Left**
- Table 141. **BLUFOR Company Team Transitions from B1117 Execute Action Right**
- Table 142. **BLUFOR Company Team Transitions from B1121 Defend**
- Table 143. **BLUFOR Company Team Transitions B1124 Breach An Obstacle**
- Table 144. **BLUFOR Company Team Transitions from CIS B1129 CONDUCT HASTY RIVER/ GAP CROSSING**
- Table 145. **BLUFOR Company Team Transitions from CIS B1132 React to a Reinforced Obstacle**
- Table 146. **BLUFOR Company Team Transitions from B1144 Perform Service Station Resupply**
- Table 147. **BLUFOR Air Calvary/Recon Troop Transitions from B1301 Engage Targets**
- Table 148. **BLUFOR Air Calvary/Recon Troop Transitions from B1307 Conduct Area Reconnaissance**
- Table 149. **BLUFOR Air Calvary/Recon Troop Transitions from B1310 Perform Actions on Contact**
- Table 150. **BLUFOR Attack Helicopter Company Transitions from B1401 Engage Targets**

- Table 151. **BLUFOR Armored Calvary Troop Transitions from CIS B1502 Perform Zone Reconnaissance**
- Table 152. **BLUFOR Armored Calvary Troop Transitions from CIS B1503 Perform Screen Operations**
- Table 153. **BLUFOR Armored Calvary Troop Transitions from B1505 Perform Actions on Contact**
- Table 154. **BLUFOR Armored Calvary Troop Transitions from B1507 Delay in Troop Sector**
- Table 155. **BLUFOR Armored Calvary Troop Transitions from CIS B1511 Conduct Tactical Movement**
- Table 156. **BLUFOR Armored Calvary Troop Transitions from B1512 Occupy an Assembly Area**
- Table 157. **BLUFOR Armored Calvary Troop Transitions from B1517 Perform Hasty Obstacle Breaching**
- Table 158. **BLUFOR Armored Cavalry Troop Transitions from B1520 Perform Troop Resupply Operations**
- Table 159. **BLUFOR Anti-armor Company Transitions from B1701, Occupy Assembly Area**
- Table 160. **BLUFOR Assault Helicopter Company Transitions from B2602 Conduct Air Assault Operations**

<i>Table 5 BLUFOR Company Team Transitions from B1101 Perform Tactical Movement</i>				
Condition/Event	B1104 Perform Actions on Contact	B1119 React To Indirect Fire	B1113 Defend Against Air Attack	B1132 React To Reinforced Obstacle
Receiving Ground Fire	X			
Antitank Threat	X			
Non-Antitank Threat	X			
Receiving Air Fire			X	
Receiving Indirect Fire		X		
Encounter Obstacle				X

<i>Table 6 BLUFOR Company Team Transitions from B1102 Perform Tactical Road March</i>				
Condition/Event	B1104 Perform Actions on	B1119 React To Indirect Fire	B1113 Defend Against Air Attack	B1132 React To Reinforced Obstacle

	Contact			
Receiving Ground Fire	X			
Receiving Air Fire			X	
Antitank Threat	X			
Non-Antitank Threat	X			
Receiving Indirect Fire		X		
Encounter Obstacle				X

Table 7 BLUFOR Company Team Transitions from B1104 Perform Actions on Contact

Condition/Event	B1119 React To Indirect Fire	B1113 Defend Against Air Attack	B1132 React To Reinforced Obstacle
Receiving Air Fire		X	
Receiving Indirect Fire	X		
Encounter Obstacle			X

Table 8 BLUFOR Company Team Transitions from B1105 Assault An Enemy Position (Mounted)

Condition/Event	B1104 Perform Actions on Contact*	B1119 React To Indirect Fire	B1113 Defend Against Air Attack	B1132 React To Reinforced Obstacle
Receiving Ground Fire	X			
Receiving Air Fire			X	
Receiving Indirect Fire		X		
Encounter Obstacle				X
NOTE: Only executed if contact is made before attack is launched.				

Table 9 BLUFOR Company Team Transitions from B1108 Perform Attack Position Actions

Condition/Event	B1104 Perform Actions on Contact	B1119 React to Indirect Fire	B1113 Defend Against Air Attack	B1132 React to Reinforced Obstacle
Receiving Ground Fire	X			
Receiving Air Fire			X	
Antitank Threat	X			
Non-Antitank Threat	X			

Receiving Indirect Fire		X		
Encounter Obstacle				X

Table 10 BLUFOR Company Team Transitions from B1111 Consolidate on the Objective

Condition/Event	B1104 Perform Actions on Contact	B1119 React to Indirect Fire
Receiving Air Fire	X	
Receiving Indirect Fire		X

Table 11. BLUFOR Company Team Transitions from B1112 Reorganize on the Objective

Condition/Event	B1121 Defend	B1119 React to Indirect Fire	B1113 Defend Against Air Attack	B1132 React to Reinforced Obstacle
Receiving Ground Fire	X			
Receiving Air Fire			X	
Receiving Indirect Fire		X		
Antitank Threat	X			
Non-Antitank Threat	X			
Encounter Obstacle				X

Table 12 BLUFOR Mechanized Platoon Transitions from B0101 Execute Column Formation

Condition/Event	B0112 React to Indirect Fire	B0113 React to Air Attack While Moving	B0155 React to Contact (Mounted)	B0156 Take Action At Obstacle
Receiving Ground Fire			X	
Receiving Indirect Fire	X			
Antitank Threat			X	
Non-Antitank Threat			X	
Receiving Air Fire		X		
Obstacle Encountered				X

Table 13 BLUFOR Mechanized Platoon Transitions from B0102 Execute Line Formation

Condition/Event	B0112 React to Indirect Fire	B0113 React to Air Attack While Moving	B0155 React to Contact (Mounted)	B0156 Take Action At Obstacle

Receiving Ground Fire			X	
Receiving Indirect Fire	X			
Antitank Threat			X	
Non-Antitank Threat			X	
Receiving Air Fire		X		
Obstacle Encountered				X

Table 14 BLUFOR Mechanized Platoon Transitions from B0104 Execute Wedge Formation

Condition/Event	B0112 React to Indirect Fire	B0113 React to Air Attack While Moving	B0155 React to Contact (Mounted)	B0156 Take Action at Obstacle
Receiving Ground Fire			X	
Receiving Indirect Fire	X			
Antitank Threat			X	
Non-Antitank Threat			X	
Receiving Air Fire		X		
Obstacle Encountered				X

Table 15 BLUFOR Mechanized Platoon Transitions from B0105 Execute Herringbone Formation

Condition/Event	B0112 React to Indirect Fire	B0113 React to Air Attack While Moving	B0155 React to Contact (Mounted)
Receiving Ground Fire			X
Receiving Indirect Fire	X		
Antitank Threat			X
Non-Antitank Threat			X
Receiving Air Fire		X	

Table 16 BLUFOR Mechanized Platoon Transitions from B0109 Execute Bounding Overwatch

Condition/Event	B0112 React to Indirect Fire	B0113 React to Air Attack While Moving	B0155 React to Contact (Mounted)	B0156 Take Action at Obstacle
Receiving Ground Fire			X	
Receiving Air Fire		X		
Receiving Indirect Fire	X			
Antitank Threat			X	
Non-Antitank Threat			X	
Obstacle Encountered				X

<i>Table 17. BLUFOR Mechanized Platoon Transitions from B0110 Execute Action Right</i>			
Condition/Event	B0112 React to Indirect Fire	B0113 React to Air Attack While Moving	B0156 Take Actions at Obstacle
Receiving Indirect Fire	X		
Receiving Air Fire		X	
Obstacle Encountered			X

<i>Table 18. BLUFOR Mechanized Platoon Transitions from B0112 React to Indirect Fire</i>	
Condition/Event	B0113 React to Air Attack
Receiving Air Fire	X

<i>Table 19 BLUFOR Mechanized Platoon Transitions from B0115 Execute Hasty Dismount</i>				
Condition/Event	B0112 React to Indirect Fire	B0113 React to Air Attack While Moving	B0155 React to Contact (Mounted)	B0156 Take Actions at Obstacle
Receiving Ground Fire			X	
Receiving Indirect Fire	X			
Antitank Threat			X	
Non-Antitank Threat			X	
Receiving Air Fire		X		
Obstacle Encountered				X

<i>Table 20 BLUFOR Mechanized Platoon Transitions from B0116 Mount Vehicle</i>				
Condition/Event	B0112 React to Indirect Fire	B0113 React to Air Attack While Moving	B0155 React to Contact (Mounted)	B0156 Take Action at Obstacle
Receiving Ground Fire			X	
Receiving Indirect Fire	X			
Antitank Threat			X	
Non-Antitank Threat			X	
Receiving Air Fire		X		
Obstacle Encountered				X

Table 21. BLUFOR Mechanized Platoon Transitions from B0118 Conduct Tactical Road March

Condition/Event	B0112 React to Indirect Fire	B0113 React to Air Attack While Moving	B0155 React to Contact (Mounted)	B0156 Take Action at Obstacle
Receiving Ground Fire			X	
Receiving Indirect Fire	X			
Antitank Threat			X	
Non-Antitank Threat			X	
Receiving Air Fire		X		
Obstacle Encountered				X

Table 22. BLUFOR Mechanized Platoon Transitions from B0123 Assault Mounted

Condition/Event	B0112 React to Indirect Fire	B0113 React to Air Attack While Moving	B0156 Take Action at Obstacle
Receiving Indirect Fire	X		
Receiving Air Fire		X	
Obstacle Encountered			X

Table 23 BLUFOR Mechanized Platoon Transitions from B0125 Consolidate and Reorganize

Condition/Event	B0112 React to Indirect Fire	B0113 React to Air Attack While Moving	B0155 React to Contact (Mounted)	B0146 React to Contact Dismounted	B0119 React To Direct Fire at 614
Receiving Ground Fire			X	X	
Receiving Indirect Fire	X				
Antitank Threat			X		X
Non-Antitank Threat			X	X	
Receiving Air Fire		X			

Table 24 BLUFOR Mechanized Platoon Transitions from B0155 React to Contact (Mounted)

Condition/Event	B0112 React to Indirect Fire	B0113 React to Air Attack While Moving	B0156 Take Action at Obstacle
Receiving Indirect Fire	X		
Receiving Air Fire		X	
Obstacle Encountered			X

<i>Table 25 BLUFOR Tank Platoon Transitions from B0002 Execute Staggered Column Formation</i>				
Condition/Event	B0013 React to Indirect Fires	B0019 Take Active AD Measures Moving	B0022 Execute Actions on Contact	B0036 Take Actions at Obstacle
Receiving Ground Fire			X	
Receiving Air Fire		X		
Receiving Indirect Fire	X			
Antitank Threat			X	
Non-Antitank Threat			X	
Obstacle Encountered				X

<i>Table 26 BLUFOR Tank Platoon Transitions from B0003 Execute Wedge Formation</i>				
Condition/Event	B0013 React to Indirect Fires	B0019 Take Active AD Measures Moving	B0022 Execute Actions on Contact	B0036 Take Actions at Obstacle
Receiving Ground Fire			X	
Receiving Air Fire		X		
Receiving Indirect Fire	X			
Antitank Threat			X	
Non-Antitank Threat			X	
Obstacle Encountered				X

<i>Table 27 BLUFOR Tank Platoon Transitions from B0004 Execute Line Formation</i>				
Condition/Event	B0013 React to Indirect Fires	B0019 Take Active AD Measures Moving	B0022 Execute Actions on Contact	B0036 Take Actions at Obstacle
Receiving Ground Fire			X	
Receiving Air Fire		X		
Receiving Indirect Fire	X			
Antitank Threat			X	
Non-Antitank Threat			X	
Obstacle Encountered				X

Table 28 BLUFOR Tank Platoon Transitions from B0008 Execute Herringbone Formation

Condition/Event	B0013 React to Indirect Fires	B0020 React to Air Attack Stationary	B0022 Execute Actions on Contact	B0033 React to Dismounted Attack
Receiving Ground Fire			X	X
Receiving Air Fire		X		
Receiving Indirect Fire	X			
Antitank Threat			X	X
Non-Antitank Threat			X	X

Table 29 BLUFOR Tank Platoon Transitions from B0009 Execute Action Drill (Front)

Condition/Event	B0013 React to Indirect Fires	B0019 Take Active AD Measures Mounting	B0022 Execute Actions on Contact	B0014 Execute Contact Drill	B0036 Take Actions at Obstacles
Receiving Ground Fire			X		
Receiving Air Fire		X			
Receiving Indirect Fire	X				
Antitank Threat			X	X	
Non-Antitank Threat				X	
Enemy >= Unit's Subordinate					
In Range of Primary Weapons			X		
Obstacle Encountered					X
Not in Range of Primary Weapon				X	

Table 30 BLUFOR Tank Platoon Transitions from B0010 Execute Action Drill (Right)

Condition/Event	B0013 React to Indirect Fires	B0019 Take Active AD Measures Mounting	B0022 Execute Actions on Contact	B0014 Execute Contact Drill	B0036 Take Actions at Obstacles
Receiving Ground Fire			X		
Receiving Air Fire		X			
Receiving Indirect Fire	X				
Antitank Threat			X	X	
Non-Antitank Threat				X	
Enemy >= Unit's Subordinate					
In Range of Primary Weapons			X		

Obstacle Encountered					X
Not in Range of Primary Weapon				X	

Table 31 BLUFOR Tank Platoon Transitions from B0011 Execute Action Drill (Left)

Condition/Event	B0013 React to Indirect Fires	B0019 Take Active AD Measures Mounting	B0022 Execute Actions on Contact	B0014 Execute Contact Drill	B0036 Take Actions at Obstacles
Receiving Ground Fire			X		
Receiving Air Fire		X			
Receiving Indirect Fire	X				
Antitank Threat			X	X	
Non-Antitank Threat				X	
Enemy >= Unit's Subordinate					
In Range of Primary Weapons			X		
Obstacle Encountered					X
Not in Range of Primary Weapon				X	

Table 32 BLUFOR Tank Platoon Transitions from B0012 Execute Action Drill (Rear)

Condition/Event	B0013 React to Indirect Fires	B0019 Take Active AD Measures Mounting	B0022 Execute Actions on Contact	B0014 Execute Contact Drill	B0036 Take Actions at Obstacles
Receiving Ground Fire			X		
Receiving Air Fire		X			
Receiving Indirect Fire	X				
Antitank Threat			X	X	
Non-Antitank Threat				X	
Enemy >= Unit's Subordinate					
In Range of Primary Weapons			X		
Obstacle Encountered					X
Not in Range of Primary Weapon				X	

Table 33 BLUFOR Tank Platoon Transitions from B0013 React to Indirect Fires

Condition/Event	B0019 Air Attack Moving	B0020 React to Air Attack Stationary
Receiving Air Fire	X	X

Table 34 BLUFOR Tank Platoon Transitions from B0015 Execute Traveling

Condition/Event	B0013 React to Indirect Fires	B0019 Take Active AD Measures Mounting	B0022 Execute Actions on Contact	B0014 Execute Contact Drill	B0036 Take Actions at Obstacles
Receiving Ground Fire			X		
Receiving Air Fire		X			
Receiving Indirect Fire	X				
Antitank Threat			X	X	
Non-Antitank Threat				X	
In Range of Primary Weapons			X		
Not in Range of Primary Weapon				X	
Obstacle Encountered					X

Table 35 BLUFOR Tank Platoon Transitions from B0016 Execute Bounding Overwatch

Condition/Event	B0013 React to Indirect Fires	B0019 Take Active AD Measures Mounting	B0022 Execute Actions on Contact	B0014 Execute Contact Drill	B0036 Take Actions at Obstacles
Receiving Ground Fire			X		
Receiving Air Fire		X			
Receiving Indirect Fire	X				
Antitank Threat			X	X	
Non-Antitank Threat				X	
In Range of Primary Weapons			X		
Not in Range of Primary Weapon				X	
Obstacle Encountered					X

Table 36 BLUFOR Tank Platoon Transitions from B0018 Perform Assembly Area Activities

Condition/Event	B0013 React to Indirect Fires	B0020 React to Air Attack Stationary	B0025 Occupy Hasty BP	B0023 React to Dismounted Attack
Receiving Ground Fire			X	X
Receiving Air Fire		X		
Receiving Indirect Fire	X			
Antitank Threat			X	X
Non-Antitank Threat			X	X

Table 37 BLUFOR Tank Platoon Transitions from B0021 Conduct Tactical Road March

Condition/Event	B0013 React to Indirect Fires	B0019 Air Attack Moving	B0020 React to Air Attack Stationary	B0022 Execute Actions on Contact	B0014 Execute Contact Drill	B0036 Take Actions at Obstacles
Receiving Ground Fire				X		
Receiving Air Fire		X	X			
Receiving Indirect Fire	X					
Antitank Threat				X	X	
Non-Antitank Threat					X	
In Range of Primary Weapon				X		
Not in Range of Primary Weapon					X	
Obstacle Encountered						X

Table 38 BLUFOR Tank Platoon Transitions from B0022 Execute Actions on Contact

Condition/Event	B0013 React to Indirect Fires	B0019 Air Attack Moving	B0020 React to Air Attack Stationary
Receiving Ground Fire			
Receiving Air Fire		X	X
Receiving Indirect Fire	X		
Antitank Threat	X		
Non-Antitank Threat	X		
Enemy <= Unit			
Enemy > Unit			
Enemy >= Unit's Subordinate			
Not In Range of Primary Weapons	X		
Moving			
Halted			

NOTE: Execute B0013 only if not in contact with OPFOR tanks or ATGM which are within effective range.

Table 39 BLUFOR Tank Platoon Transitions from B0026 Occupy Platoon Battle Position

Condition/Event	B0013 React to Indirect Fires	B0020 React to Air Attack Stationary	B0022 Execute Action on Contact
Receiving Ground Fire			X
Receiving Air Fire		X	
Receiving Indirect Fire	X		
Antitank Threat			X
Non-Antitank Threat			X

<i>Table 40 BLUFOR Tank Platoon Transitions from B0029 Consolidate and Reorganize</i>			
Condition/Event	B0013 React to Indirect Fires	B0020 React to Air Attack Stationary	B0022 Execute Actions on Contact
Receiving Ground Fire			X
Receiving Air Fire		X	
Receiving Indirect Fire	X		
Antitank Threat			X
Non-Antitank Threat			X

<i>Table 41 BLUFOR Tank Platoon Transitions from B0030 Perform Platoon Fire and Movement</i>				
Condition/Event	B0013 React to Indirect Fires	B0019 Air Attack Moving	B0020 React to Air Attack Stationary	B0036 Action at Obstacle
Receiving Air Fire		X	X	
Receiving Indirect Fire	X			
Obstacle Encountered				X
NOTE: Execute B0013 and B0036 only if not in contact with OPFOR tanks or ATGM which are within effective range.				

<i>Table 42 BLUFOR Tank Platoon Transitions from B0031 Assault Enemy Position</i>				
Condition/Event	B0013 React to Indirect Fires	B0019 Air Attack Moving	B0020 React to Air Attack Stationary	B0036 Action at Obstacle
Receiving Air Fire		X	X	
Receiving Indirect Fire	X			
Obstacle Encountered				X
NOTE: Execute B0013 and B0036 only if not in contact with OPFOR tanks or ATGM which are within effective range.				

<i>Table 43 BLUFOR Tank Platoon Transitions from B0032 Execute Platoon Defensive Mission</i>		
Condition/Event	B0013 React to Indirect Fires	B0020 React to Air Attack Stationary
Receiving Air Fire		X
Receiving Indirect Fire	X	
NOTE: Execute B0013 only if not in contact with OPFOR tanks or ATGM which are within effective range.		

<i>Table 44 BLUFOR Tank Platoon Transitions from B0034 Displace to Subsequent Battle Position</i>					
Condition/Event	B0013 React	B0019 Air	B0022	B0014	B0020 React

	to Indirect Fires	Attack Moving	Execute Actions on Contact	Execute Contact Drill	to Air Attack Stationary
Receiving Ground Fire			X		
Receiving Air Fire		X			X
Receiving Indirect Fire	X				
Antitank Threat			X	X	
Non-Antitank Threat				X	
In Range of Primary Weapons			X		
Not in Range of Primary Weapons				X	

Table 45 BLUFOR Tank Platoon Transitions from B0041 Perform Resupply Operations

Condition/Event	B0013 React to Indirect Fires	B0019 Air Attack Moving	B0020 React to Air Attack Stationary	B0022 Execute Actions on Contact
Receiving Ground Fire				X
Receiving Air Fire		X	X	
Receiving Indirect Fire	X			
Antitank Threat				X
Non-Antitank Threat				X

Table 46 BLUFOR M109A5 Artillery Platoon Transitions from B0602 Perform Prep For Movement

Condition/Event	B0606 Defend and Secure Platoon Area and Material	B0607 Use Active AD Measures
Enemy Contact (Ground)	X	
Receiving Indirect Fire	X	
Enemy Contact (Air)		X

Table 47 BLUFOR M109A5 Artillery Platoon Transitions from B0603 Conduct Tactical Movement

Condition/Event	B0606 Defend and Secure Platoon Area and Material
Enemy Contact (Ground)	

Table 48 BLUFOR M109A5 Artillery Platoon Transitions from B0604 Conduct Occupation of Position Area

Condition/Event	B0603 Conduct Tactical Movement	B0606 Defend and Secure Platoon Area and Material	B0607 Use Active AD Measures
Enemy Contact (Ground)		X	
Ambush, Road Not Blocked	X		
Ambush, Road Blocked	X		

Receiving Indirect Fire		X	
Enemy Contact (Air)			X

Table 49 BLUFOR M109A5 Artillery Platoon Transitions from B0605 Establish a Firing Capability

Condition/Event	B0606 Defend and Secure Platoon Area and Material	B0607 Use Active AD Measures
Enemy Contact (Ground)	X	
Receiving Indirect Fire	X	
Enemy Contact (Air)		X

Table 50 BLUFOR M109A5 Artillery Platoon Transitions from B0606 Defend and Secure Platoon Area and Material

Condition/Event	B0607 Use Active AD Measures
Enemy Contact (Air)	X

Table 51 BLUFOR M109A5 Artillery Platoon Transitions from B0607 Use Active AD Measures

Condition/Event	B0603 Conduct Tactical Movement	B0606 Defend and Secure Platoon Area and Material
Enemy Contact while moving (Ground)	X	
Enemy Contact while stationary (Ground)		X
Ambush, Road Not Blocked	X	
Ambush, Road Blocked	X	
Receiving Indirect Fire		X

Table 52 BLUFOR M109A5 Artillery Platoon Transitions from B0608 Sustain

Condition/Event	B0606 Defend and Secure Platoon Area and Material	B0607 Use Active AD Measures
Enemy Contact (Ground)	X	
Receiving Indirect Fire	X	
Enemy Contact (Air)		X

Table 53 BLUFOR M109A6 Artillery Platoon Transitions from B0652 Perform Prep For Movement

Condition/Event	B0656 Defend and Secure Platoon Area and Material	B0657 Use Active AD Measures
Enemy Contact (Ground)	X	
Receiving Indirect Fire	X	
Enemy Contact (Air)		X

<i>Table 54 BLUFOR M109A6 Artillery Platoon Transitions from B0653 Conduct Tactical Movement</i>	
Condition/Event	
No Transitions	

<i>Table 55 BLUFOR M109A6 Artillery Platoon Transitions from B0654 Conduct Occupation of Position Area</i>			
Condition/Event	B0653 Conduct Tactical Movement	B0656 Defend and Secure Platoon Area and Material	B0657 Use Active AD Measures
Enemy Contact (Ground)		X	
Ambush, Road Not Blocked	X		
Ambush, Road Blocked	X		
Receiving Indirect Fire		X	
Enemy Contact (Air)			X

<i>Table 56 BLUFOR M109A6 Artillery Platoon Transitions from B0655 Establish a Firing Capability</i>		
Condition/Event	B0656 Defend and Secure Platoon Area and Material	B0657 Use Active AD Measures
Enemy Contact (Ground)	X	
Receiving Indirect Fire	X	
Enemy Contact (Air)		X

<i>Table 57 BLUFOR M109A6 Artillery Platoon Transitions from B0656 Defend and Secure Platoon Area and Material</i>	
Condition/Event	B0657 Use Active AD Measures
Enemy Contact (Air)	X

<i>Table 58 BLUFOR M109A6 Artillery Platoon Transitions from B0657 Use Active AD Measures</i>		
Condition/Event	B0653 Conduct Tactical Movement	B0656 Defend and Secure Platoon Area and Material
Enemy Contact while moving (Ground)	X	
Enemy Contact while stationary (Ground)		X
Ambush, Road Not Blocked	X	
Ambush, Road Blocked	X	
Receiving Indirect Fire		X

<i>Table 59 BLUFOR M109A6 Artillery Platoon Transitions from B0658 Sustain</i>		
Condition/Event	B0656 Defend and Secure Platoon Area and Material	B0657 Use Active AD Measures
Enemy Contact (Ground)	X	
Receiving Indirect Fire	X	
Enemy Contact (Air)		X

<i>Table 60 BLUFOR MLRS Artillery Platoon Transitions from B2801 Conduct Tactical Road March</i>	
Condition/Event	B2803 Defend and Secure Area and Material
Enemy Contact (Ground)	X
Ambush, Road Not Blocked	X
Ambush, Road Blocked	X
Enemy Contact (Air)	X

<i>Table 61 BLUFOR MLRS Artillery Platoon Transitions from B2802 Occupy Position</i>	
Condition/Event	B2803 Defend and Secure Area and Material
Enemy Contact (Ground)	X
Ambush, Road Not Blocked	X
Ambush, Road Blocked	X
Receiving Indirect Fire	X
Enemy Contact (Air)	X

<i>Table 62 BLUFOR MLRS Artillery Platoon Transitions from B2803 Defend and Secure Platoon Area and Material</i>	
Condition/Event	
No Transitions	

<i>Table 63 BLUFOR MLRS Artillery Platoon Transitions from B2804 Sustain</i>		
Condition/Event	B2801 Conduct Tactical Road March	B2803 Defend and Secure Platoon Area and Material
Enemy Contact (Ground)		X
Ambush, Road Not Blocked		X
Ambush, Road Blocked		X
Receiving Indirect Fire	X	
Enemy Contact (Air)		X

Table 64 BLUFOR MLRS Battery Headquarters Transitions from B2902 Occupy Position

Condition/Event	B2903 Defend and Secure Battery Area and Material
Enemy Contact (Ground)	X
Receiving Indirect Fire	X
Enemy Contact (Air)	X

Table 65 BLUFOR MLRS Battery Headquarters Transitions from B2903 Defend and Secure Battery Area and Material

Condition/Event	
No Transitions	

Table 66 BLUFOR Mortar Platoon and Section Transitions from B0401 Operate by Split Platoon / Section

Condition/Event	
No Transitions	

Table 67 BLUFOR Mortar Platoon and Section Transitions from B0402 Occupy Firing Position

Condition/Event	B0406 Defend Against Ground Attack	B0407 React To Air Attack	B0411 Defend Against Indirect Fire
Enemy Contact (Ground)	X		
Enemy Contact (Air)		X	
Receiving Indirect Fire			X

Table 68 BLUFOR Mortar Platoon and Section Transitions from B0403 Conduct Tactical Road March

Condition/Event	B0407 React To Air Attack	B0411 Defend Against Indirect Fire
Enemy Contact (Air)	X	
Receiving Indirect Fire		X

Table 69 BLUFOR Mortar Platoon and Section Transitions from B0405 Occupy Assembly Area

Condition/Event	B0406 Defend Against Ground Attack	B0407 React To Air Attack	B0411 Defend Against Indirect Fire
Enemy Contact (Ground)	X		
Enemy Contact (Air)		X	
Receiving Indirect Fire			X

<i>Table 70 BLUFOR Mortar Platoon and Section Transitions from B0406 Defend Against Ground Attack</i>		
Condition/Event	B0407 React To Air Attack	B0411 Defend Against Indirect Fire
Enemy Contact (Air)	X	
Receiving Indirect Fire		X

<i>Table 71 BLUFOR Mortar Platoon and Section Transitions from B0407 React To Air Attack</i>		
Condition/Event	B0406 Defend Against Ground Attack	B0411 Defend Against Indirect Fire
Enemy Contact (Ground)	X	
Receiving Indirect Fire		X

<i>Table 72 BLUFOR Mortar Platoon and Section Transitions from B0411 Defend Against Indirect Fire</i>		
Condition/Event	B0406 Defend Against Ground Attack	B0407 React To Air Attack
Enemy Contact (Ground)	X	
Enemy Contact (Air)		X

<i>Table 73 BLUFOR Support Platoon Transitions from B1801 Perform Assembly Area Activities</i>				
Condition/Event	B1803 Defend Against Ground Ambush, Road Not Blocked	B1804 Defend Against Ground Ambush (Road Blocked)	B1805 Secure and Defend Unit Position	B1806 Use Active AD Measures
Enemy Contact (Ground)	X	X	X	
Ambush, Road Not Blocked	X			
Ambush, Road Blocked		X		
Receiving Indirect Fire			X	
Enemy Contact (Air)				X

<i>Table 74 BLUFOR Support Platoon Transitions from B1802 Conduct A Convoy Movement</i>				
Condition/Event	B1803 Defend Against Ground Ambush, Road Not Blocked	B1804 Defend Against Ground Ambush (Road Blocked)	B1805 Secure and Defend Unit Position	B1806 Use Active AD Measures
Enemy Contact (Ground)	X	X		
Ambush, Road Not Blocked	X			
Ambush, Road Blocked		X		

Receiving Indirect Fire			X	
Enemy Contact (Air)				X

Table 75 BLUFOR Support Platoon Transitions from B1803 Defend Against Ground Ambush, Road Not Blocked

Condition/Event	B1805 Secure and Defend Unit Position	B1806 Use Active AD Measures
Receiving Indirect Fire	X	
Enemy Contact (Air)		X

Table 76 BLUFOR Support Platoon Transitions from B1804 Defend Against Ground Ambush (Road Blocked)

Condition/Event	B1805 Secure and Defend Unit Position	B1806 Use Active AD Measures
Receiving Indirect Fire	X	
Enemy Contact (Air)		X

Table 77 BLUFOR Support Platoon Transitions from B1805 Secure and Defend Unit Position

Condition/Event	B1805 Secure and Defend Unit Position	B1806 Use Active AD Measures	B1807 Occupy Covered and Concealed Positions
Enemy Contact (Ground)	X		
Receiving Indirect Fire			X
Enemy Contact (Air)		X	

Table 78 BLUFOR Support Platoon Transitions from B1806 Use Active AD Measures

Condition/Event	B1805 Secure and Defend Unit Position	B1806 Use Active AD Measures	B1807 Occupy Covered and Concealed Positions
Enemy Contact (Air)		X	

Table 79 BLUFOR Support Platoon Transitions from B1807 Occupy Covered and Concealed Positions

Condition/Event	B1805 Secure and Defend Unit Position	B1806 Use Active AD Measures
Enemy Contact (Ground)	X	
Receiving Indirect Fire		X
Enemy Contact (Air)		X

Table 80 BLUFOR Maintenance Platoon Transitions from B1901 Plan and Conduct A Convoy

Condition/Event	B1803	B1804	B1902	B1903
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	Defend Against Ground Ambush, Road Not Blocked	Defend Against Ground Ambush (Road Blocked)	Secure and Defend Unit Position	Use Active AD Measures
Enemy Contact (Ground)	X	X		
Ambush, Road Not Blocked	X			
Ambush, Road Blocked		X		
Receiving Indirect Fire			X	
Enemy Contact (Air)				X

Table 81 BLUFOR Maintenance Platoon Transitions from B1902 Secure and Defend Unit Position

Condition/Event	B1902 Secure and Defend Unit Position	B1903 Use Active AD Measures
Enemy Contact (Ground)	X	
Receiving Indirect Fire		X
Enemy Contact (Air)		X

Table 82 BLUFOR Maintenance Platoon Transitions from B1903 Use Active AD Measures

Condition/Event	B1902 Secure and Defend Unit Position	B1903 Use Active AD Measures
Enemy Contact (Ground)	X	
Receiving Indirect Fire		X
Enemy Contact (Air)		X

Table 83 BLUFOR Maintenance Platoon Transitions from B1904 Occupy Assembly Area

Condition/Event	B1803 Defend Against Ground Ambush, Road Not Blocked	B1804 Defend Against Ground Ambush (Road Blocked)	B1902 Secure and Defend Unit Position	B1903 Use Active AD Measures
Enemy Contact (Ground)	X	X		
Ambush, Road Not Blocked	X			
Ambush, Road Blocked		X		
Receiving Indirect Fire			X	
Enemy Contact (Air)				X

Table 84 BLUFOR Maintenance Platoon Transitions from B1905 Select and Establish UMCP or Field Maintenance Sites (Occupy Position)

Condition/Event	B1902 Secure and Defend Unit Position	B1903 Use Active AD Measures
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Enemy Contact (Ground)	X		
Receiving Indirect Fire		X	
Enemy Contact (Air)			X

Table 85 BLUFOR Battalion Task Force Headquarters Transitions from B2501 Move a Command Post

Condition/Event	B1803 Defend Against Ground Ambush, Road Not Blocked	B1804 Defend Against Ground Ambush (Road Blocked)	B1805 Secure and Defend Unit Position	B1806 Use Active AD Measures
Enemy Contact (Ground)			X	
Ambush, Road Not Blocked	X			
Ambush, Road Blocked		X		
Receiving Indirect Fire			X	
Enemy Contact (Air)				X

Table 86 BLUFOR Battalion Task Force Headquarters Transitions from B2502 Establish a Command Post

Condition/Event	B1805 Secure and Defend Unit Position	B1903 Use Active AD Measures
Enemy Contact (Ground)	X	
Receiving Indirect Fire	X	
Enemy Contact (Air)		X

Table 87 BLUFOR Combat Engineering Support Unit Transitions from B0901 Move Mounted

Condition/Event	B0906 React To Direct Fire	B0907 React To Indirect Fire	B0908 Secure and Defend Unit Position	B0905 Use Active AD Measures
Enemy Contact (Ground)	X			
Ambush, Road Not Blocked	X			
Ambush, Road Blocked			X	
Receiving Indirect Fire		X		
Enemy Contact (Air)				X

Table 88 BLUFOR Combat Engineering Support Unit Transitions from B0902 Secure at Halt

Condition/Event	B0906 React To Direct Fire	B0907 React To Indirect Fire	B0908 Secure and Defend Unit Position	B0905 Use Active AD Measures
Enemy Contact (Ground)	X			
Ambush, Road Not Blocked	X			

Ambush, Road Blocked			X	
Receiving Indirect Fire		X		
Enemy Contact (Air)				X

Table 89 BLUFOR Combat Engineering Support Unit Transitions from B0903 Change Formation (Mounted)

Condition/Event	B0906 React To Direct Fire	B0907 React To Indirect Fire	B0908 Secure and Defend Unit Position	B0905 Use Active AD Measures
Enemy Contact (Ground)	X			
Ambush, Road Not Blocked	X			
Ambush, Road Blocked			X	
Receiving Indirect Fire		X		
Enemy Contact (Air)				X

Table 90 BLUFOR Combat Engineering Support Unit Transitions from B0904 Occupy Assembly Area

Condition/Event	B0906 React To Direct Fire	B0907 React To Indirect Fire	B0908 Secure and Defend Unit Position	B0905 Use Active AD Measures
Enemy Contact (Ground)	X			
Ambush, Road Not Blocked	X			
Ambush, Road Blocked			X	
Receiving Indirect Fire		X		
Enemy Contact (Air)				X

Table 91 BLUFOR Combat Engineering Support Unit Transitions from B0905 Use Active AD Measures

Condition/Event	B0906 React To Direct Fire	B0907 React To Indirect Fire	B0908 Secure and Defend Unit Position	B0905 Use Active AD Measures
Enemy Contact (Ground)	X			
Ambush, Road Not Blocked	X			
Ambush, Road Blocked			X	
Receiving Indirect Fire		X		
Enemy Contact (Air)				X

<i>Table 92 BLUFOR Combat Engineering Support Unit Transitions from B0906 React to Direct Fire (ATGM)</i>				
Condition/Event	B0906 React To Direct Fire	B0907 React To Indirect Fire	B0908 Secure and Defend Unit Position	B0905 Use Active AD Measures
Enemy Contact (Ground)	X			
Ambush, Road Not Blocked	X			
Ambush, Road Blocked			X	
Receiving Indirect Fire	X			
Enemy Contact (Air)	X			

<i>Table 93 BLUFOR Combat Engineering Support Unit Transitions from B0907 React to Indirect Fire</i>				
Condition/Event	B0906 React To Direct Fire	B0907 React To Indirect Fire	B0908 Secure and Defend Unit Position	B0905 Use Active AD Measures
Enemy Contact (Ground)	X			
Ambush, Road Not Blocked	X			
Ambush, Road Blocked			X	
Receiving Indirect Fire		X		
Enemy Contact (Air)				X

<i>Table 94 BLUFOR Combat Engineering Support Unit Transitions from B0908 Secure and Defend Unit Position</i>				
Condition/Event	B0906 React To Direct Fire	B0907 React To Indirect Fire	B0908 Secure and Defend Unit Position	B0905 Use Active AD Measures
Enemy Contact (Ground)	X			
Ambush, Road Not Blocked	X			
Ambush, Road Blocked			X	
Receiving Indirect Fire		X		
Enemy Contact (Air)				X

<i>Table 95 BLUFOR Combat Engineering Support Unit Transitions from B0909 Conduct Tactical Road March</i>				
Condition/Event	B0906 React To Direct Fire	B0907 React To Indirect Fire	B0908 Secure and Defend Unit Position	B0905 Use Active AD Measures
Enemy Contact (Ground)	X			
Ambush, Road Not Blocked	X			
Ambush, Road Blocked			X	
Receiving Indirect Fire		X		
Enemy Contact (Air)				X

Enemy Contact (Ground)	X			
Ambush, Road Not Blocked	X			
Ambush, Road Blocked			X	
Receiving Indirect Fire		X		
Enemy Contact (Air)				X

<i>Table 96 BLUFOR Tank Platoon Transitions from B0001 Execute Column Formation</i>				
Condition/Event	B0013 React to Indirect Fires	B0022 Execute Actions on Contact	B0019 Take Active AD Measures While Moving	B0036 Take Actions at Obstacle
Receiving Air Fire			X	
Receiving Indirect Fire	X			
Antitank Threat (Lethal)		X		
Within Range of Primary Weapons		X		
Moving			X	
Obstacle Encountered				X

*Note: B0036, Take Actions at Obstacle, is deferred but is listed in the SI Transition Table for completeness.

**CISs B0009, B0010, B0011 and B0012, (Execute Action Drills), are covered under CIS B0022, Execute Actions on Contact.

Table 97 BLUFOR Tank Platoon Transitions from B0006 Execute Vee Formation.					
Condition/Event	B0013 React to Indirect Fires	B0022 Execute Actions on Contact	B0014 Execute Contact Drill	B0019 Take Active AD Measures While Moving	B0036 Take Action at Obstacles
Receiving Air Fire				X	
Receiving Indirect Fire	X				
Antitank Threat (Lethal)		X	X		
Non-Antitank Threat (Non-Lethal)			X		
Within Range of Primary Weapons		X			
Not Within Range of Primary Weapon			X		
Obstacle Encountered					X

** CIS B0009, B0010, B0011, and B0012 (Execute Action Drills) are covered under CIS B0022, Execute Action on Contact.

Table 98 BLUFOR Tank Platoon Transitions from B0012 EXECUTE ACTION DRILL (REAR)					
Condition/Event	B0013 React to Indirect Fires	B0022 Execute Actions on Contact	B0019 Take Active AD Measures While Moving	B0014 Execute Contact Drill	*B0036 Take Actions at Obstacle
Receiving Air Fire			X		
Receiving Indirect Fire	X				
Antitank Threat (Lethal)		X		X	
Non-Antitank Threat (Non-Lethal)				X	
Within Range of Primary Weapons		X			
Out of Range of Primary Weapons				X	
Moving			X		
At Obstacle					X

**CISs B0009, B0010, B0011 and B0012, (Execute Action Drills), are covered under CIS B0022, Execute Actions on Contact.

<i>Table 99 BLUFOR Tank Platoon Transitions from B0014 EXECUTE CONTACT DRILL</i>				
Condition/Event	B0013 React to Indirect Fires	B0022 Execute Actions on Contact	B0019 Take Active AD Measures While Moving	B0036 Take Actions at Obstacle
Receiving Air Fire			X	
Receiving Indirect Fire	X			
Antitank Threat (Lethal)		X		
Within Range of Primary Weapons		X		
Obstacle Encountered				X

** CIS B0009, B0010, B0011, and B0012 (Execute Action Drills) and CIS B0014, (Execute Contact Drill) are covered under CIS B0022, Execute Action on Contact

<i>Table 100 BLUFOR Tank Platoon Transitions from B0017 Execute Traveling Overwatch</i>					
Condition/Event	B0013 React to Indirect Fires	B0019 Take Active AD Measures While Moving	B0022 Execute Actions on Contact	B0014 Contact Drill	B0036 Take Action at Obstacle
Receiving Air Fire		X			
Receiving Indirect Fire	X				
Antitank Threat (Lethal)			X	X	
Non Antitank Threat (Non Lethal)				X	
In Range of Primary Weapon			X		
Not in Range of Primary Weapon				X	
Obstacle Encountered					X

<i>Table 101 BLUFOR Tank Platoon Transitions from B0024 Attack By Fire</i>			
Condition/Event	B0013 React to Indirect Fires	B0022 Execute Actions on Contact	B0020 Take Active AD Measures While Stationary
Receiving Air Fire			X
Receiving Indirect Fire	X		
Antitank Threat (Lethal)		X	
Within Range of Primary Weapons		X	

** CISs B0009, B0010, B0011, and B0012, (Execute Action Drills), are covered under CIS B0022, Execute Action on Contact

<i>Table 102 BLUFOR Tank Platoon Transitions from B0025 Conduct Hasty Occupation of a Battle Position</i>			
Condition/Event	B0013 React to Indirect Fires	B0020 Take Active AD Measures While Stationary	B0022 Execute Actions on Contact
Receiving Air Fire		X	
Receiving Indirect Fire	X		
Antitank Threat (Lethal)			X
Within Range of Primary Weapons			X

<i>Table 103 BLUFOR Tank Platoon Transitions from B0033 React To Dismounted Attack</i>			
Condition/Event	B0013 React to Indirect Fires	B0020 Take Active AD Measures While Stationary	B0022 Execute Actions on Contact
Receiving Air Fire		X	
Receiving Indirect Fire	X		
Antitank Threat (Lethal)			X
Within Range of Primary Weapons			X

<i>Table 104 BLUFOR Tank Platoon Transitions from B0036 Take Actions At An Obstacle</i>			
Condition/Event	B0013 React to Indirect Fires	B0019 Take Active AD Measures While Moving	B0020 Take Active AD Measures While Stationary
Receiving Air Fire		X	X
Receiving Indirect Fire	X		

<i>Table 105 BLUFOR Mechanized Platoon Transitions from B0107 Execute Traveling</i>				
Condition/Event	B0112 React to Indirect Fire	B0155 React to Contact (Mounted)	B0113 React to Air Attack	B0156 Take Actions at Obstacle
Receiving Air Fire			X	
Receiving Indirect Fire	X			
Enemy > Unit		X		
Obstacle Encountered				X

<i>Table 106 BLUFOR Mechanized Platoon Transitions from B0108 Execute Traveling Overwatch</i>				
Condition/Event	B0112 React to Indirect Fire	B0155 React to Contact (Mounted)	B0113 React to Air Attack	B0156 Take Actions at

				Obstacle
Receiving Air Fire			X	
Receiving Indirect Fire	X			
Antitank Threat (Lethal)		X		
Obstacle Encountered				X

Table 107 BLUFOR Mechanized Platoon Transitions from B0109 Execute Bounding Overwatch

Condition/Event	B0112 React to Indirect Fire	B0113 React to Air Attack	B0155 React to Contact (Mounted)	B0156 Take Actions at Obstacle
Receiving Ground Fire			X	
Receiving Indirect Fire	X			
Antitank Threat (Lethal)			X	
Non-Antitank Threat (Non-Lethal)			X	
Receiving Air Fire		X		
Obstacle Encountered				X

Table 108 BLUFOR Mechanized Platoon Transitions from B0111 Execute Action Left

Condition/Event	B0112 React to Indirect Fire	B0113 React to Air Attack	B0156 Take Actions at Obstacle
Receiving Air Fire		X	
Receiving Indirect Fire	X		
Obstacle Encountered			X

NOTE: Do not execute either CIS B0112 or B0113 if conducting direct fire engagement with enemy possessing tank or ATGM weapons.

Table 109 BLUFOR Mechanized Platoon Transitions from B0117, Occupy Assembly Area

Condition/Event	B0119 React To Direct Fire/ATGM	B0155 React to Contact (Mounted)	B0112 React to Indirect Fire	B0113 React to Air Attack	B0146 React to Contact (Dismounted)
Receiving Ground Fire					X
Receiving Air Fire				X	
Receiving Indirect Fire			X		
Antitank Threat (Lethal)	X				
Non-Antitank Threat (Non-Lethal)		X			
Enemy <= Unit					X

<i>Table 110 BLUFOR Mechanized Platoon Transitions from B0119 REACT TO DIRECT FIRE/ATGM</i>	
Condition/Event	B0113 React to Air Attack
Receiving Air Fire	X

<i>Table 111 BLUFOR Mechanized Platoon Transitions from B0120 Support by Fire</i>				
Condition/Event	B0112 React to Indirect Fire	B0155 React to Contact (Mounted)	B0113 React to Air Attack	B0119 React to Direct Fire/ATGM
Receiving Air Fire			X	
Receiving Indirect Fire	X			
Antitank Threat (Lethal)				X
Non-Antitank Threat (Non-Lethal)		X		

Note: The Situational Interrupts for this CIS (B0120) only apply while unit is moving to objective.

<i>Table 112 BLUFOR Mechanized Platoon Transitions from B0121 Fire and Movement</i>			
Condition/Event	B0112 React to Indirect Fire	B0113 React to Air Attack	B0156 Take Actions at Obstacles
Receiving Air Fire		X	
Receiving Indirect Fire	X		
Obstacle Encountered			X

<i>Table 113 BLUFOR Mechanized Platoon Transitions from B0122 BREACH OBSTACLE</i>		
Condition/Event	B0112 React to Indirect Fire	B0113 React to Air Attack
Receiving Air Fire		X
Receiving Indirect Fire	X	

<i>Table 114 BLUFOR Mechanized Platoon Transitions from B0126 Establish Hasty Position</i>					
Condition/Event	B0119 React To Direct Fire/ATGM	B0155 React to Contact (Mounted)	B0112 React to Indirect Fire	B0113 React to Air Attack	B0146 React to Contact (Dismounted)
Receiving Ground Fire					X
Receiving Air Fire				X	
Receiving Indirect Fire			X		
Antitank Threat (Lethal)	X				
Non-Antitank Threat (Non-Lethal)		X			
Enemy <= Unit					X
Enemy > Unit					X

Table 115 BLUFOR Mechanized Platoon Transitions from B0128 Defend Battle Position

Condition/Event	B0112 React to Indirect Fire	B0113 React to Air Attack
Receiving Air Fire		X
Receiving Indirect Fire	X	

Table 116 BLUFOR Mechanized Platoon Transitions from B0129 Disengage Mounted

Condition/Event	B0112 React to Indirect Fire	B0113 React to Air Attack
Receiving Air Fire		X
Receiving Indirect Fire	X	

Table 117 BLUFOR Mechanized Platoon Transitions from B0134 CROSS DEFILE

Condition/Event	B0112 React to Indirect Fire	B0113 React to Air Attack	B0146 React to Contact (Dismounted)	B0156 Take Actions at Obstacle
Receiving Ground Fire			X	
Receiving Air Fire		X		
Receiving Indirect Fire	X			
Obstacle Encountered				X

Table 118 BLUFOR Mechanized Platoon Transitions from B0135 Clear Wood Line

Condition/Event	B0155 React to Contact (Mounted)	B0112 React to Indirect Fire	B0113 React to Air Attack	B0146 React to Contact (Dismounted)	B0156 Take Actions at Obstacles
Receiving Ground Fire	X			X	
Receiving Air Fire			X		
Receiving Indirect Fire		X			
Within Range of Primary Weapons	X			X	
Moving	X			X	
Halted	X			X	
Obstacle Encountered					X

Table 119 BLUFOR Mechanized Platoon Transitions from B0137 Emplace Hasty Protective Minefield

Condition/Event	B0119 React To Direct Fire/ATGM	B0155 React to Contact (Mounted)	B0112 React to Indirect Fire	B0113 React to Air Attack	B0146 React to Contact (Dismounted)
Receiving Ground Fire	X	X			X
Receiving Air Fire				X	
Receiving Indirect Fire			X		
Antitank Threat (Lethal)	X				

Within Range of Primary Weapons		X			X
Moving		X			X
Halted		X			X

*Note: B0156, Take Actions at Obstacle, is deferred and is not currently listed in the SI Transition Table.

Table 120 BLUFOR Mechanized Platoon Transitions from B0143 Conduct Screen/Guard Operations

Condition/Event	B0119 React To Direct Fire/ATGM	B0155 React to Contact (Mounted)	B0112 React to Indirect Fire	B0113 React to Air Attack	B0156 Take Actions at Obstacle
Receiving Ground Fire		X			
Receiving Air Fire				X	
Receiving Indirect Fire			X		
Antitank Threat (Lethal)	X				
Non-Antitank Threat (Non-Lethal)		X			
Obstacle					X

Table 121 BLUFOR Mechanized Platoon Transitions from B0144 Move Dismounted (Traveling and Traveling Overwatch)

Condition/Event	B0112 React to Indirect Fire	B0113 React to Air Attack	B0146 React to Contact (Dismounted)	B0156 Take Actions at Obstacles
Receiving Air Fire		X		
Receiving Indirect Fire	X			
Non-Antitank Threat (Non-Lethal)			X	
Obstacle Encountered				X

Table 122 BLUFOR Mechanized Platoon Transitions from B0145 Cross Danger Area (Dismounted)

Condition/Event	B0112 React to Indirect Fire	B0113 React to Air Attack	B0146 React to Contact (Dismounted)	B0156 Take Actions at Obstacles
Receiving Air Fire		X		
Receiving Indirect Fire	X			
Non-Antitank Threat (Non-Lethal)			X	
Obstacle Encountered				X

Table 123 BLUFOR Mechanized Platoon Transitions from B0146 React To Contact (Dismounted)

Condition/Event	B0112 React to Indirect	B0113 React to Air	B0156 Take Actions at
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	Fire	Attack	Obstacles
Receiving Air Fire		X	
Receiving Indirect Fire	X		
Encounter Obstacle			X

Table 124 BLUFOR Mechanized Platoon Transitions from B0149 Disengage Dismounted

Condition/Event	B0112 React to Indirect Fire	B0113 React to Air Attack
Receiving Air Fire		X
Receiving Indirect Fire	X	

Table 125 BLUFOR Mechanized Platoon Transitions from B0152 Sustain

Condition/Event	B0119 React To Direct Fire/ATGM	B0155 React to Contact (Mounted)	B0112 React to Indirect Fire	B0113 React to Air Attack
Receiving Air Fire				X
Receiving Indirect Fire			X	
Antitank Threat (Lethal)	X			
Non-Antitank Threat (Non-Lethal)		X		

*Note: B0128, Defend BP, is not a situational interrupt because the Tailgate resupply method is not being implemented in CCTT.

Table 126 BLUFOR Mechanized Platoon Transitions from B0154 Move Dismounted (Bounding Overwatch)

Condition/Event	B0112 React to Indirect Fire	B0113 React to Air Attack	B0146 React to Contact (Dismounted)	B0156 Take Actions at Obstacles
Receiving Air Fire		X		
Receiving Indirect Fire	X			
Non-Antitank Threat (Non-Lethal)			X	
Obstacle Encountered				X

Table 127 BLUFOR Mechanized Platoon Transitions from B0156 Take Actions At Obstacle

Condition/Event	B0119 React To Direct Fire/ATGM	B0155 React to Contact (Mounted)	B0112 React to Indirect Fire	B0113 React to Air Attack	B0146 React to Contact (Dismounted)
Receiving Ground Fire		X			X
Receiving Air Fire				X	
Receiving Indirect Fire			X		
Antitank Threat (Lethal)	X				
Mounted		X			

Dismounted					X
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Table 128 BLUFOR Scout Platoon Transitions from B0301 Perform a Tactical Road March

Condition/Event	B0305 React to Indirect Fire	B0313 Execute Actions on Contact	B0321 Take Active Air Defense Measures While Moving
Receiving Air Fire			X
Receiving Indirect Fire	X		
Antitank Threat		X	
Non Antitank Threat		X	

Table 129 BLUFOR Scout Platoon Transitions from B0302 Occupy Assembly Area

Condition/Event	B0305 React to Indirect Fire	B0313 Execute Actions on Contact	B0321 Take Active Air Defense Measures While Moving
Receiving Air Fire			X
Receiving Indirect Fire	X		
AT Threat		X	
Small Arms Threat		X	
MG Threat		X	

Table 130 BLUFOR Scout Platoon Transitions from B0305 React To Indirect Fires

Condition/Event	B0313 Execute Action on Contact
Receiving Ground Fire	X
Non-Antitank Threat (Non-Lethal)	X
Enemy <= Unit	X
Within Range of Primary Weapons	X

Table 131 BLUFOR Scout Platoon Transitions from B0308 Conduct Bounding Overwatch

Condition/Event	B0305 React to Indirect Fire	B0313 Execute Actions on Contact	B0321 Take Active Air Defense Measures While Moving
Receiving Ground Fire		X	
Receiving Air Fire			X
Receiving Indirect Fire	X		
AT Threat		X	
Small Arms Threat		X	

MG Threat		X	
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Table 132 BLUFOR Scout Platoon Transitions from B0310 Perform A Zone Reconnaissance

Condition/Event	B0305 React to Indirect Fire	B0313 Execute Actions on Contact	B0321 Take Active Air Defense Measures While Moving
Receiving Ground Fire		X	
Receiving Air Fire			X
Receiving Indirect Fire	X		
Enemy <= Unit		X	
Enemy > Unit		X	

Table 133 BLUFOR Scout Platoon Transitions from B0313 EXECUTE ACTIONS ON CONTACT

Condition/Event	B0305 React to Indirect Fire	B0321 Take Active Air Defense Measures While Moving
Receiving Air Fire		X
Receiving Indirect Fire	X	

Table 134 BLUFOR Scout Platoon Transitions from B0315 Conduct A Screen

Condition/Event	B0305 React to Indirect Fire	B0313 Execute Actions on Contact	B0321 Take Active Air Defense Measures While Moving
Receiving Ground Fire		X	
Receiving Air Fire			X
Receiving Indirect Fire	X		
Enemy <= Unit		X	
Enemy > Unit		X	

Table 135 BLUFOR Scout Platoon Transitions from B0318 Perform Resupply Operations

Condition/Event	B0305 React to Indirect Fire	B0313 Execute Actions on Contact	B0321 Take Active Air Defense Measures While Moving
Receiving Ground Fire		X	
Receiving Air Fire			X
Receiving Indirect Fire	X		
Antitank Threat (Lethal)		X	
Non-Antitank Threat (Non-Lethal)		X	
Moving			X

<i>Table 136 BLUFOR Scout Platoon Transitions from B0321 Take Active Air Defense Measures While Moving</i>		
Condition/Event	B0305 React to Indirect Fire	B0313 Execute Actions on Contact
Receiving Ground Fire		X
Receiving Indirect Fire	X	
Antitank Threat (Lethal)		X
Non-Antitank Threat (Non-Lethal)		X

<i>Table 137 BLUFOR Air Defense Artillery Platoon Transitions from B0808 Travel to and Occupy the NDP</i>	
Condition/Event	B0804 Provide Stinger Air Defense from a Static Position
Receiving Air Fire	X
Enemy Air In Range	X

NOTE: It is the responsibility of the SAF Operator to issue new orders to the ADA platoon when ground forces are encountered to re-route the platoon out of harms way. The SAF operator will be notified through the Spot Report process when enemy ground forces are encountered.

<i>Table 138 BLUFOR Company Team Transitions from B1106 Occupy Assembly Area</i>			
Condition/Event	B1104 Perform Actions on Contact	B1113 Defend Against Air Attack	B1119 React To Indirect Fires
Receiving Ground Fire	X		
Receiving Air Fire		X	
Receiving Indirect Fire			X
Enemy <= Unit	X		
Enemy > Unit	X		

<i>Table 139 BLUFOR Company Team Transitions from B1107 Perform Assault Position Activities</i>				
Condition/Event	B1104 Perform Actions on Contact	B1113 Defend Against Air Attack	B1119 React To Indirect Fires	B1132 React to Reinforce Obstacle
Receiving Ground Fire	X			
Receiving Air Fire		X		
Receiving Indirect Fire			X	
Encounter Obstacle				X

<i>Table 140 BLUFOR Company Team Transitions from B1116 Execute Action Left</i>				
Condition/Event	B1104 Perform Actions on Contact	B1113 Defend Against Air Attack	B1119 React To Indirect Fires	B1132 React To Reinforce Obstacle
Receiving Ground Fire	X			
Receiving Air Fire		X		

Receiving Indirect Fire			X	
Encounter Obstacle				X

Table 141 BLUFOR Company Team Transitions from B1117 Execute Action Right

Condition/Event	B1104 Perform Actions on Contact	B1113 Defend Against Air Attack	B1119 React To Indirect Fires	B1132 React To Reinforce Obstacle
Receiving Ground Fire	X			
Receiving Air Fire		X		
Receiving Indirect Fire			X	
Encounter Obstacle				X

Table 142 BLUFOR Company Team Transitions from B1121 Defend

Condition/Event	B1113 Defend Against Air Attack	B1119 React To Indirect Fires
Receiving Air Fire	X	
Receiving Indirect Fire		X

*Note: B1118, Execute Actions on Air Attack is deferred and is not currently listed in the SI Transition Table B1113, Defend Against Air Attack will be used in lieu of B1118.

Table 143 BLUFOR Company Team Transitions B1124 Breach An Obstacle

Condition/Event	B1104 Perform Actions on Contact	B1113 Defend Against Air Attack	B1119 React To Indirect Fires
Receiving Ground Fire	X		
Receiving Air Fire		X	
Receiving Indirect Fire			X

Table 144 BLUFOR Company Team Transitions from CIS B1129 CONDUCT HASTY RIVER/ GAP CROSSING

Condition/Event	B1104 Perform Actions on Contact	B1113 Defend Against Air Attack	B1119 React To Indirect Fires
Receiving Ground Fire	X		
Receiving Air Fire		X	
Receiving Indirect Fire			X

Table 145 BLUFOR Company Team Transitions from CIS B1132 React to a Reinforced Obstacle

Condition/Event	B1104 Perform Actions on Contact	B1113 Defend Against Air Attack	B1119 React To Indirect Fires
Receiving Ground Fire	X		
Receiving Air Fire		X	
Receiving Indirect Fire			X

<i>Table 146 BLUFOR Company Team Transitions from B1144 Perform Service Station Resupply</i>			
Condition/Event	B1104 Perform Actions on Contact	B1113 Defend Against Air Attack	B1119 React To Indirect Fires
Receiving Ground Fire	X		
Receiving Air Fire		X	
Receiving Indirect Fire			X

<i>Table 147 BLUFOR Air Cavalry/Recon Troop Transitions from B1301 Engage Targets</i>		
Condition/Event	B1303 Use Countermeasures against enemy ADA to ensure aircraft survivability.	B1310 - Perform actions on contact
Receiving Ground Fire		X
Subjected to Enemy ADA	X	

<i>Table 148 BLUFOR Air Cavalry/Recon Troop Transitions from B1307 Conduct Area Reconnaissance</i>		
Condition/Event	B1303 Use Countermeasures against enemy ADA to ensure aircraft survivability.	B1310 - Perform actions on contact
Receiving Ground Fire		X
Subjected to ADA Artillery	X	

*Note: B1304, and B1314 are being deferred and will be replaced by B1310 Perform Actions on Contact

<i>Table 149 BLUFOR Air Cavalry/Recon Troop Transitions from B1310 Perform Actions on Contact</i>	
Condition/Event	B1403 Use Countermeasures against enemy ADA to ensure aircraft survivability.
Subjected to Enemy ADA	X

<i>Table 150 BLUFOR Attack Helicopter Company Transitions from B1401 Engage Targets</i>	
Condition/Event	B1403 Use Countermeasures against enemy ADA to ensure aircraft survivability.
Subjected to Enemy ADA	X

<i>Table 151 BLUFOR Armored Cavalry Troop Transitions from CIS B1502 Perform Zone Reconnaissance</i>					
Condition/Event	B1505 Perform Actions on Contact	B1518 Take Active AD Measures Against Hostile Aircraft	B1522 React to Indirect Fire	B1517 Hasty Obstacle Breaching	B1129 Perform Hasty River/Gap Crossing

Receiving Ground Fire	X				
Receiving Air Fire		X			
Receiving Indirect Fire			X		
Enemy <= Unit	X				
Enemy > Unit	X				
Obstacle Encountered				X	X

*Note: B1522 is being deferred and will be replaced by B1119 Company Team React to Indirect Fire.

<i>Table 152 BLUFOR Armored Cavalry Troop Transitions from CIS B1503 Perform Screen Operations</i>					
Condition/Event	B1505 Perform Actions on Contact	B1518 Take Active AD Measures Against Hostile Aircraft	B1522 React to Indirect Fire	B1517 Perform Hasty Obstacle Breaching	B1129 Perform Hasty River/Gap Crossing
Receiving Ground Fire	X				
Receiving Air Fire		X			
Receiving Indirect Fire			X		
Antitank Threat (Lethal)	X				
Enemy <= Unit	X				
Enemy > Unit	X				
Obstacle Encountered				X	X

*Note: B1522 is being deferred and will be replaced by B1119 Company Team React to Indirect Fire.

<i>Table 153 BLUFOR Armored Cavalry Troop Transitions from B1505 Perform Actions on Contact</i>				
Condition/Event	B1518 Take Active AD Measures Against Hostile Aircraft	B1522 React to Indirect Fire	B1517 Perform Hasty Obstacle Breaching	B1129 Conduct Hasty River/ Gap Crossing
Receiving Air Fire	X			
Receiving Indirect Fire		X		
Encountering Obstacle			X	X

*Note: B1522 is being deferred and will be replaced by B1119 Company Team React to Indirect Fire.

<i>Table 154 BLUFOR Armored Cavalry Troop Transitions from B1507 Delay in Troop Sector</i>			
Condition/Event	B1505 Perform Actions on Contact	B1518 Take Active AD Measures Against Hostile	B1522 React to Indirect Fire

		Aircraft	
Receiving Air Fire		X	
Receiving Indirect Fire			X
Enemy > Unit	X		
Enemy >= Unit's Subordinate	X		

*Note: B1522 is being deferred and will be replaced by B1119 Company Team React to Indirect Fire.

<i>Table 155 BLUFOR Armored Cavalry Troop Transitions from CIS B1511 Conduct Tactical Movement</i>					
Condition/Event	B1505 Perform Actions on Contact	B1518 Take Active AD Measures Against Hostile Aircraft	B1522 React to Indirect Fire	B1517 Perform Hasty Obstacle Breaching	B1129 Conduct Hasty River/ Gap Crossing
Receiving Ground Fire	X				
Receiving Air Fire		X			
Receiving Indirect Fire			X		
Antitank Threat (Lethal)	X				
Enemy <= Unit	X				
Enemy > Unit	X				
Obstacle Encountered				X	X

*Note: B1522 is being deferred and will be replaced by B1119 Company Team React to Indirect Fire.

<i>Table 156 BLUFOR Armored Cavalry Troop Transitions from B1512 Occupy an Assembly Area</i>		
Condition/Event	B1505 Perform Actions on Contact	B1518 Take Active AD Measures Against Hostile Aircraft
Receiving Air Fire		X
Receiving Indirect Fire	X	
Contact with enemy Maneuver forces.	X	

*Note: B1522 is being deferred and will be replaced by B1119 Company Team React to Indirect Fire.

<i>Table 157 BLUFOR Armored Cavalry Troop Transitions from B1517 Perform Hasty Obstacle Breaching</i>			
Condition/Event	B1505 Perform Actions on Contact	B1518 Take Active AD Measures Against Hostile Aircraft	B1522 React to Indirect Fire

Receiving Air Fire		X	
Receiving Indirect Fire			X
Enemy <= platoon Unit	X		
Enemy > platoon Unit	X		
Enemy unit on near side of obstacle	X		

*Note: B1522 is being deferred and will be replaced by B1119 Company Team React to Indirect Fire.

<i>Table 158 BLUFOR Armored Cavalry Troop Transitions from B1520 Perform Troop Resupply Operations</i>				
Condition/Event	B1505 Perform Actions on Contact	B1518 Defend Against Air Attack	B1119 React To Indirect Fires	B1129 Conduct Hasty River/Gap Crossing
Receiving Ground Fire	X			
Receiving Air Fire		X		
Receiving Indirect Fire			X	X

<i>Table 159 BLUFOR Antiarmor Company Transitions from B1701, Occupy Assembly Area</i>			
Condition/Event	B1104 Perform Actions on Contact	B1113 Defend Against Air Attack	B1119 React To Indirect Fires
Receiving Ground Fire	X		
Receiving Air Fire		X	
Receiving Indirect Fire			X
Enemy <= Unit	X		
Enemy > Unit	X		
Enemy >= Unit's Subordinate	X		

<i>Table 160 BLUFOR Assault Helicopter Company Transitions from B2602 Conduct Air Assault Operations</i>	
Condition/Event	B1403 Use Countermeasures against enemy ADA to ensure aircraft survivability.
Subjected to Enemy ADA	X

Note: CIS B2607 React to Indirect Fire is not being implemented in SAF at this time.

1. OPFOR TRANSITION TABLES

The OPFOR Transition Tables are included in the following:

- Table 161 **OPFOR Tank Platoon Transitions from Take Actions at Obstacle (Hvy-0009)**

- Table 162 **OPFOR Tank Platoon Transitions from Execute a Fire Engagement (Hvy-0010)**
- Table 163 **OPFOR Tank Platoon Transitions from Occupy a Platoon Strong Point (Hvy-0012)**
- Table 164 **OPFOR Tank Platoon Transitions from Provide Force Security (Hvy-0019)**
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<i>Table 161 OPFOR Tank Platoon Transitions from Take Actions at Obstacle (Hvy-0009)</i>			
Condition/Event	Hvy-0023 Air Defense Actions	Hvy-0013 Actions Incoming Artillery Fire	Hvy-0010 Fire Engagement
Receiving Ground Fire			X
Receiving Air Fire	X		
Receiving Indirect Fire		X	

<i>Table 162 OPFOR Tank Platoon Transitions from Execute a Fire Engagement (Hvy-0010)</i>		
Condition/Event	Hvy-0013 Actions on Incoming Artillery Fire	Hvy-0023 Air Defense Measures
Receiving Air Fire		X
Receiving Indirect Fire	X	

<i>Table 163 Tank Platoon Transitions from Occupy a Platoon Strong Point (Hvy-0012)</i>			
Condition/Event	Hvy-0015 Conduct a Defense	Hvy-0013 Actions on Incoming Artillery Fire	Hvy-0023 Air Defense Measures
Receiving Air Fire			X
Receiving Indirect Fire		X	
Enemy Assaults	X		

<i>Table 164 OPFOR Tank Platoon Transitions from Provide Force Security (Hvy-0019)</i>			
Condition/Event	Hvy-0013 Actions on Incoming Artillery Fire	Hvy-0023 Air Defense Measures	Hvy-0010 Execute Fire Engagement
Receiving Air Fire		X	
Receiving Indirect Fire	X		
Receiving Ground Fire			X

<i>Table 165 OPFOR Tank Platoon Transitions from Occupy Temporary Defensive Position Point (Hvy-0027)</i>			
Condition/Event	Hvy-0015 Conduct a	Hvy-0013 Actions on	Hvy-0023 Air Defense

	Defense	Incoming Artillery Fire	Measures
Receiving Air Fire			X
Receiving Indirect Fire		X	
Enemy Assaults	X		

Table 166 OPFOR Tank Platoon Transitions from Traveling (Hvy-0028)

Condition/Event	Hvy-0023 Air Defense Actions	Hvy-0013 Actions Incoming Artillery Fire	Hvy-0022 Assault Enemy Position	Hvy-0010 Fire Engagement	Hvy-0012 Occupy Temporary Defensive Position	Hvy-0029 Take Evasive Action
Receiving Small Arms Fire				X		
Receiving AT Fire			X	X	X	X
Receiving Air Fire	X					
Receiving Indirect Fire		X				
Enemy < Plt			X	X		
Platoon=Enemy			X	X		
Enemy > Platoon					X	
Enemy in Small Arms/Light MG Range			X	X	X	
Enemy in Heavy MG Range				X	X	
Enemy in AT weapon Range						X

Table 167 OPFOR Tank Platoon Transitions from Execute Evasive Actions (Hvy-0029)

Condition/Event	Hvy-0023 Air Defense Actions	Hvy-0013 Actions Incoming Artillery Fire
Receiving Air Fire	X	
Receiving Indirect Fire		X

Table 168 OPFOR Tank Platoon Transitions from Withdrawal/Disengagement (Hvy-0030)

Condition/Event	Hvy-0023 Air Defense Actions	Hvy-0013 Actions Incoming Artillery Fire	Hvy-0027 Occupy a Temporary Defensive Position	Hvy-0015 Conduct a Defense
Receiving Ground Fire			X	X
Receiving Air Fire	X			
Receiving Indirect Fire		X		

Table 169 OPFOR Tank Company Transitions from Traveling (Hvy-0108)

Condition/Event	Hvy-0023	Hvy-0013	Hvy-0113	Hvy-0118
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	Air Defense Actions	Actions Incoming Artillery Fire	Assault Enemy Position	Occupy Temporary Defensive Position
Receiving Small Arms Fire				
Receiving AT Fire			X	X
Receiving Air Fire	X			
Receiving Indirect Fire		X		
Enemy < Co			X	
Co=Enemy			X	
Enemy > Company				X
Enemy in Small Arms/Light MG Range			X	X
Enemy in Heavy MG Range				X

Table 170 OPFOR Tank Company Transitions from Assault an Enemy Position (Hvy-0113)

Condition/Event	Hvy-0013 Take Actions On Incoming Artillery (Fire Support Element Only)
Receiving Indirect Fire	X

Table 171 OPFOR Tank Company Transitions from Occupy a Defensive Strongpoint (Hvy-0117)

Condition/Event	Hvy-0119 Conduct a Defense	Hvy-0013 Actions on Incoming Artillery Fire	Hvy-0023 Air Defense Actions
Receiving Air Fire			X
Receiving Indirect Fire		X	
Enemy Assaults	X		
Encircled by Enemy			

Table 172 OPFOR Tank Company Transitions from Occupy a Temporary Defensive Position (Hvy-0118)

Condition/Event	Hvy-0119 Conduct a Defense	Hvy-0013 Actions on Incoming Artillery Fire	Hvy-0023 Air Defense Actions	Hvy-0427 Combat in Encirclement
Receiving Air Fire			X	
Receiving Indirect Fire		X		
Enemy Assaults	X			
Encircled by Enemy				X

Table 173 OPFOR Tank Company Transitions from Provide Movement Security Element (Hvy-0121)

Condition/Event	Hvy-0113 Assault an Enemy Position	Hvy-0118 Occupy a Temporary	Hvy-0013 Actions on Incoming Artillery	Hvy-0023 Take Air Defense Measures
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		Defensive Position	Fire	
Receiving Ground Fire	X	X		
Receiving Air Fire				X
Receiving Indirect Fire			X	
Antitank Threat	X			
Non-Antitank Threat	X			
Enemy <= Unit	X			
Enemy > Unit		X		
Enemy < Unit's Subordinate				
Enemy >= Unit's Subordinate	X			
Enemy within Close Range	X			

Ranges Are:	<u>Motorized Rifle Units</u>	<u>Tank Units</u>	<u>All Other Units</u>
Close Range	<500m	<1500m	Not Applicable
Intermediate Range	500 - 1500 m	1500 - 2500m	Not Applicable
Long Range	1500 - 4000m	2500 - 4000m	Not Applicable

Table 174 OPFOR Tank Company Transitions from Execute a Meeting Engagement (Hvy-0129)

Condition/Event	Hvy-0113 Assault Enemy Position	Hvy-0118 Occupy Temporary Defensive Position
Receiving AT Fire	X	X
Enemy < Co	X	
Co=Enemy	X	
Enemy > Company		X
Enemy in Small Arms/Light MG Range	X	X
Enemy in Heavy MG Range		X

Table 175 OPFOR Tank Company Transitions from Withdrawal/Disengagement (Hvy-0130)

Condition/Event	Hvy-0023 Air Defense Actions	Hvy-0013 Actions Inc Artillery Fire	Hvy-0119 Conduct a Defense	Hvy-0118 Occupy Temporary Defensive Position
Receiving Ground Fire			X	X
Receiving Air Fire	X			
Receiving Indirect Fire		X		
Enemy > Unit				X

Enemy within Close Range				
Enemy within Intermediate Range			X	
Enemy within Long Range			X	
Identified				
Not Identified			X	

Ranges Are:	<u>Motorized Rifle Units</u>	<u>Tank Units</u>	<u>All Other Units</u>
Close Range	<500m	<1500m	Not Applicable
Intermediate Range	500 - 1500 m	1500 - 2500m	Not Applicable
Long Range	1500 - 4000m	2500 - 4000m	Not Applicable

Table 176 OPFOR Tank Battalion Transitions from Traveling (Hvy-0203)

Condition/Event	Hvy-0023 Air Defense Actions	Hvy-0013 Actions Incoming Artillery Fire
Receiving Air Fire	X	
Receiving Indirect Fire		X
Enemy Engaging		

Table 177 OPFOR Tank Battalion Transitions from Occupy an Assembly Area (Hvy-0204)

Condition/Event	Hvy-0023 Air Defense Actions	Hvy-0013 Actions Incoming Artillery Fire
Receiving Air Fire	X	
Receiving Indirect Fire		X

Table 178 OPFOR Tank Battalion Transitions from Attack From the March (Hvy-0207)

Condition/Event	Hvy-0118 Occupy A Temporary Defensive Position
Enemy > Unit	X

Table 179 OPFOR Motorized Rifle Platoon Transitions from Take Actions at Obstacle (Hvy-0302)

Condition/Event	Hvy-0308 Conduct a Temporary Defense	Hvy-0303 Air Defense Measures
Receiving Ground Fire	X	
Receiving Air Fire		X

Table 180 OPFOR Motorized Rifle Platoon Transitions from Occupy an Assembly Area (Hvy-0319)

Condition/Event	Hvy-0327 Occupy a Temporary Defensive Position	Hvy-0303 Take Air Defense Measures
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Antitank Threat	X	
Enemy > Unit	X	
Receiving Air Fire		X

Table 181 OPFOR Motorized Rifle Platoon Transitions from Withdraw/Disengage (Hvy-0325)

Condition/Event	Hvy-0324 Fire Engagement	Hvy-0329 Actions on Incoming Artillery Fire	Hvy-0303 Take Air Defense Measures
Receiving Ground Fire	X		
Receiving Air Fire			X
Receiving Indirect Fire	X	X	
Antitank Threat	X		
Non-Antitank Threat	X		
Enemy within Close Range	X		
Enemy w/in Intermediate Range	X		
Enemy w/in Long Range	X		

Table 182 OPFOR Motorized Rifle Platoon Transitions from Provide Guard Security (Hvy-0314)

Condition/Event	Hvy-0329 Actions on Incoming Artillery Fire	Hvy-0303 Air Defense Measures	Hvy-0308 Conduct a Defense
Receiving Air Fire		X	
Receiving Indirect Fire	X		
Receiving Ground Fire			X

Table 183 OPFOR Motorized Rifle Platoon Transitions from Traveling (Hvy-0328)

Condition/Event	Hvy-0303 Air Defense Actions	Hvy-0326 Assault Enemy Position	Hvy-0324 Fire Engagement	Hvy-0327 Occupy Temporary Defensive Position	Hvy-0330 Take Evasive Action	Hvy-0329 Actions on Incoming Artillery	Hvy-0302 Actions at an Obstacle
Receiving Small Arms Fire			X				
Receiving AT Fire		X	X	X	X		
Receiving Air Fire	X						
Enemy < Plt		X	X				
Platoon=Enemy		X	X				
Enemy > Platoon				X			
Enemy in Small Arms/Light MG		X	X	X			

Range							
Enemy in Heavy MG Range			X	X			
Enemy in AT weapon Range					X		
Receiving Indirect Fire						X	
Encounter Obstacle							X

Table 184 OPFOR Motorized Rifle Platoon Transitions from Evasive Actions (Hvy-0330)

Condition/Event	Hvy-0329 Actions on Incoming Artillery Fire	Hvy-0303 Air Measures
Receiving Air Fire		X
Receiving Indirect Fire	X	

Table 185 OPFOR Motorized Rifle Company Transitions from Traveling (Hvy-0408)

Condition/Event	Hvy-0415 Fire Engagement	Hvy-0413 Assault an Enemy Position	Hvy-0418 Occupy a Temporary Defensive Position	Hvy-0423 Actions on Incoming Artillery Fire
Receiving Ground Fire	X	X	X	
Receiving Air Fire				
Receiving Indirect Fire				X
Antitank Threat	X	X		
Non-Antitank Threat	X	X		
Enemy <= Unit	X	X		
Enemy > Unit	X		X	
Enemy < Unit's Subordinate	X			
Enemy >= Unit's Subordinate	X	X		
Enemy within Close Range	X	X		
Enemy within Intermediate Range	X			
Enemy within Long Range	X			

Table 186 OPFOR Motorized Rifle Company Transitions from Conduct Tactical Road March (Hvy-0407)

Condition/Event	Hvy-0415 Fire Engagement	Hvy-0413 Assault an Enemy Position	Hvy-0418 Occupy a Temporary Defensive Position	Hvy-0423 Actions on Incoming Artillery Fire
Receiving Ground Fire	X	X	X	
Receiving Air Fire				

Receiving Indirect Fire				X
Antitank Threat	X	X		
Non-Antitank Threat	X	X		
Enemy <= Unit	X	X		
Enemy > Unit	X		X	
Enemy < Unit's Subordinate	X			
Enemy >= Unit's Subordinate		X		
Enemy within Close Range	X	X		
Enemy within Intermediate Range	X			
Enemy within Long Range	X			

Table 187 OPFOR Motorized Rifle Company Transitions from Occupy an Assembly Area (Hvy-0409)

Condition/Event	Hvy-0415 Fire Engagement	Hvy-0418 Occupy a Temporary Defensive Position	Hvy-0423 Actions on Incoming Artillery Fire
Receiving Ground Fire	X	X	
Receiving Air Fire			
Receiving Indirect Fire			X
Antitank Threat	X	X	
Non-Antitank Threat	X	X	
Enemy <= Unit	X	X	
Enemy > Unit	X	X	
Enemy < Unit's Subordinate	X		
Enemy >= Unit's Subordinate		X	
Enemy within Close Range	X	X	
Enemy within Intermediate Range	X	X	
Enemy within Long Range	X	X	

Table 188 OPFOR Motorized Rifle Company Transitions from Withdraw/Disengage (Hvy-0410)

Condition/Event	Hvy-0415 Fire Engagement	Hvy-0418 Occupy Temporary Defensive Position	Hvy-0427 Conduct Combat in an Encirclement	Hvy-0423 Actions on Incoming Artillery Fire	Hvy-0303 Take Air Defense Measures
Receiving Ground Fire	X	X	X		
Receiving Indirect Fire				X	
Antitank Threat	X	X	X		
Non-Antitank Threat	X	X	X		
Enemy <= Unit	X				
Enemy > Unit	X	X	X		

Enemy >= Unit's Subordinate			X		
Enemy within Close Range	X	X	X		
Enemy within Intermediate Range	X	X	X		
Enemy within Long Range	X	X			
Enemy has Encircled			X		
Receiving Air Fire					X

Table 189 OPFOR Motorized Rifle Company Transitions from Provide Movement Security Element (Hvy-0421)

Condition/Event	Hvy-0415 Fire Engagement	Hvy-0413 Assault an Enemy Position	Hvy-0418 Occupy a Temporary Defensive Position	Hvy-0423 Actions on Incoming Art. Fire	Hvy-0303 Take Air Defense Measures
Receiving Ground Fire	X	X	X		
Receiving Air Fire					X
Receiving Indirect Fire				X	
Antitank Threat	X	X			
Non-Antitank Threat	X	X			
Enemy <= Unit	X	X			
Enemy > Unit	X		X		
Enemy < Unit's Subordinate	X				
Enemy >= Unit's Subordinate		X			
Enemy within Close Range	X	X			
Enemy within Intermediate Range	X				
Enemy within Long Range	X				

Ranges Are:	<u>Motorized Rifle Units</u>	<u>Tank Units</u>	<u>All Other Units</u>
Close Range	<500m	<1500m	Not Applicable
Intermediate Range	500 - 1500 m	1500 - 2500m	Not Applicable
Long Range	1500 - 4000m	2500 - 4000m	Not Applicable

Table 190 OPFOR Motorized Rifle Company Transitions from Conduct Combat in an Encirclement (Hvy-0427)

Condition/Event	Hvy-0423 Actions on Incoming Artillery Fire	Hvy-0303 Take Air Defense Measures
Receiving Air Fire		X
Receiving Indirect Fire	X	

<i>Table 191 OPFOR Motorized Rifle Battalion Transitions from Traveling (Hvy-0503)</i>		
Condition/Event	H0303 Take Air Defense Measures	H0329 Actions on Incoming Artillery
Receiving Air Fire	X	
Receiving Indirect Fire		X

<i>Table 192 OPFOR Motorized Rifle Battalion Transitions from Occupy an Assembly Area (Hvy-0504)</i>		
Condition/Event	Hvy-0303 Air Defense Actions	Hvy-0329 Actions Incoming Artillery Fire
Receiving Air Fire	X	
Receiving Indirect Fire		X

<i>Table 193 OPFOR Motorized Rifle Battalion Transitions from Attack From the March (Hvy-0507)</i>	
Condition/Event	Hvy-0418 Occupy Temporary Defensive Position
Enemy > Unit	X

<i>Table 194 OPFOR Mortar Battery Transitions from Traveling (Hvy-0602)</i>			
Condition/Event	Hvy-0605 Air Defense Actions	Hvy-0611 Take Actions Incoming Artillery Fire	Hvy-0606 Occupy Firing Position
Receiving AT Fire			X
Receiving Air Fire	X		
Receiving Indirect Fire		X	
Enemy < Squad			X
Squad=Enemy			X
Enemy > Squad			X

<i>Table 195 OPFOR Mortar Battery Transitions from Occupy a Firing Position (Hvy-0606)</i>			
Condition/Event	Hvy-0606 Occupy a Firing Position	Hvy-0611 Take Actions on Incoming Artillery Fire	Hvy-0605 Take Air Defense Measures
Receiving Air Fire			X
Receiving Indirect Fire		X	
Antitank Threat	X		
Enemy > Unit	X		

<i>Table 196 OPFOR Mortar Battery Transitions from Conduct an Unobserved Firing Mission (Hvy-0608)</i>		
Condition/Event	Hvy-0605 Take Air Defense Measures	Hvy-0611 Take Actions on Incoming Artillery
Receiving Ground Fire		X
Receiving Air Fire	X	

<i>Table 197 OPFOR Self-Propelled Howitzer Battery Transitions from Traveling (Hvy-0702)</i>		
Condition/Event	Hvy-0705 Air Defense Actions	Hvy-0706 Occupy Fire Position
Receiving AT Fire		X
Receiving Air Fire	X	
Enemy in AT weapon Range		X

<i>Table 198 OPFOR Self-Propelled Howitzer Battery Transitions from Occupy a Firing Position (Hvy-0706)</i>			
Condition/Event	Hvy-0711 Occupy Direct Fire Position	Hvy-0705 Take Air Defense Measures	Hvy-0713 Actions on Incoming Artillery Fire
Receiving Ground Fire		X	
Receiving Indirect Fire			X
Enemy within Close Range	X		
Enemy within Intermediate Range	X		
Enemy within Long Range	X		

<i>Table 199 OPFOR Self-Propelled Howitzer Battery Transitions from Conduct Unobserved Fire Mission (Hvy-0709)</i>		
Condition/Event	Hvy-0713 Actions on Incoming Artillery	Hvy-0705 Take Air Defense Measures
Receiving Ground Fire	X	
Receiving Air Fire		X

<i>Table 200 OPFOR Self-Propelled Howitzer Battalion Transitions from Traveling (Hvy-0802)</i>			
Condition/Event	H0711 Occupy a Direct Fire Position	H0705 Active Air Defense	H0713 Take Action On Incoming Artillery Fire
Receiving Air Fire		X	
Receiving Indirect Fire			X
Threat	X		
Enemy within Long Range	X		

<i>Table 201 OPFOR Self-Propelled Artillery Battalion Transitions from Deploy into Combat Formation (Hvy-0806)</i>		
Condition/Event	Hvy-0705 Take Air Defense Measures	Hvy-0711 Occupy a Direct Firing Position
Receiving Air Fire	X	
Enemy within Close Range		X
Enemy within Intermediate Range		X

Enemy within Long Range		X
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Table 202 OPFOR Towed Howitzer Battery Transitions from Traveling (Hvy-0902)

Condition/Event	Hvy-0705 Air Defense Actions	Hvy-0711 Occupy Direct Fire Position
Receiving AT Fire		X
Receiving Air Fire	X	
Enemy Engaging		X
Enemy in AT weapon Range		X

Table 203 OPFOR Towed Howitzer Battery Transitions from Occupy a Firing Position (Hvy-0906)

Condition/Event	Hvy-0709 Conduct Unobserved Fire Mission	Hvy-0705 Take Air Defense Measures
Receiving Air Fire		X
Enemy within Close Range	X	
Enemy within Intermediate Range	X	
Enemy within Long Range	X	

Table 204 OPFOR Towed Howitzer Battalion Transitions from Conduct Tactical Road March (Hvy-1002)

Condition/Event	Hvy-0705 Take Air Defense Measures	Hvy-0711 Conduct Direct Fire	Hvy-0713 Take Actions on Incoming Artillery Fire
Receiving Air Fire	X		
Receiving Indirect Fire			X
Enemy Engaging		X	
MG Threat		X	

Note: Self Propelled Howitzer Battery Reaction CISs are substituted for appropriate but missing Towed Artillery Battalion CISs.

Table 205 OPFOR Towed Howitzer Battalion Transitions from Deploy into Combat Formation (Hvy-1006)

Condition/Event	Hvy-0705 Take Air Defense Measures	Hvy-0711 Direct Fire Position	Hvy-0713 Take Actions on Incoming Artillery Fire
Receiving Air Fire	X		
Receiving Indirect Fire			X
Enemy Engaging		X	

<i>Table 206 OPFOR SAM Battery (SA15) Transitions from Conduct Tactical Road March (Hvy-1104)</i>			
Condition/Event	Hvy-1107 Engage Aerial Target	Hvy-1602 Take Actions Incoming Artillery Fire	Hvy-1609 React To Enemy Ground Attack
Receiving AT Fire			X
Receiving Air Fire	X		
Receiving Indirect Fire		X	
Enemy Engaging			X

<i>Table 207 OPFOR SAM Battery (SA-15) Transitions from Occupy Firing Position (Hvy-1105)</i>			
Condition/Event	Hvy-1609 React To Ground Attack	Hvy-1107 Engage an Aerial Target	Hvy-1602 Take Actions on Incoming Indirect Fire
Receiving Air Fire		X	
Receiving Indirect Fire			X
Enemy Engaging	X		

<i>Table 208 OPFOR SAM Battery (SA-15) Transitions from Engage Aerial Target (Hvy-1107)</i>		
Condition/Event	Hvy-1609 React To Ground Attack	Hvy-1602 Take Actions on Enemy Incoming Indirect Fire
Receiving Indirect Fire		X
Enemy Engaging	X	

<i>Table 209 OPFOR Antitank Gun Battery Transition from Occupy Defensive Position (Hvy-1203)</i>		
Condition/Event	H2108 Air Defense Measures	H1201 Conduct a Defense
Receiving Ground Fire		X
Receiving Air Fire	X	
Enemy Assaults		X

<i>Table 210 OPFOR Antitank Gun Battery Transitions from Traveling (Hvy-1213)</i>			
Condition/Event	H2108 Take Air Defense Measures	H2109 Actions on Incoming Artillery	H1201 Conduct a Defense
Receiving Ground Fire			X
Receiving Air Fire	X		
Receiving Indirect Fire		X	
Enemy Assaults			X

<i>Table 211 OPFOR SA-16 Platoon (SA16) Transitions from Conduct Tactical March (Hvy-1402)</i>			
Condition/Event	Hvy-1408 Engage Aerial Target	Hvy-0329 Take Actions Incoming Indirect Fire	Hvy-0324 React To Enemy Ground Attack
Receiving Air Fire	X		

Receiving Indirect Fire		X	
Enemy Engaging			X

Table 212 OPFOR SA-16 Platoon Transitions from Occupy an AD Firing Position (Hvy-1406)

Condition/Event	Hvy-0415 Conduct Fire Engagement	Hvy-1408 Engage an Aerial Target	Hvy-0329 Take Actions on Enemy Incoming Indirect Fire
Receiving Air Fire		X	
Receiving Indirect Fire			X
Enemy Engaging	X		

Table 213 OPFOR SA-16 Platoon Transitions from Engage an Aerial Target (Hvy-1408)

Condition/Event	Hvy-0415 Conduct Fire Engagement	Hvy-0329 Take Actions on Enemy Incoming Indirect Fire
Receiving Indirect Fire		X
Enemy Engaging	X	

Table 214 OPFOR Air Defense Battery (2S6) Transitions from Conduct Tactical Road March (Hvy-1504)

Condition/Event	Hvy-1507 Engage Aerial Target	Hvy-1502 Take Actions Incoming Artillery Fire	Hvy-1609 React To Enemy Ground Attack
Receiving AT Fire			X
Receiving Air Fire	X		
Receiving Indirect Fire		X	
Enemy Engaging			X

Table 215 OPFOR 2S6 Air Defense Battery Transitions from Occupy Firing Position (Hvy-1505)

Condition/Event	Hvy-1609 React To Ground Attack	Hvy-1507 Engage an Aerial Target	Hvy-1502 Take Actions on Incoming Indirect Fire
Receiving Air Fire		X	
Receiving Indirect Fire			X
Enemy Engaging	X		

Table 216 OPFOR 2S6 Air Defense Battery Transitions from Engage Aerial Target (Hvy-1507)

Condition/Event	Hvy-1609 React To Ground Attack	Hvy-1502 Take Actions on Enemy Incoming Indirect Fire
Receiving Indirect Fire		X
Enemy Engaging	X	

Table 217 OPFOR Air Defense Battery (2S6) Transitions from Employ Target Acquisition Radar (Hvy-1508)

Condition/Event	Hvy-1502 Take Actions Incoming Artillery Fire	Hvy-1609 React To Enemy Ground Attack
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Receiving Indirect Fire	X	
Enemy Engaging		X

Table 218 OPFOR Air Defense Battery (2S6) Transitions from Provide Air Defense Coverage (Hvy-1510)

Condition/Event	Hvy-1502 Take Actions Incoming Artillery Fire	Hvy-1609 React To Enemy Ground Attack
Receiving Indirect Fire	X	
Enemy Engaging		X

Table 219 OPFOR SAM Battery (SA13) Transitions from Conduct Tactical Road March (Hvy-1604)

Condition/Event	Hvy-1607 Engage Aerial Target	Hvy-1602 Take Actions Incoming Artillery Fire	Hvy-1609 React To Enemy Ground Attack
Receiving AT Fire			X
Receiving Air Fire	X		
Receiving Indirect Fire		X	
Enemy Engaging			X

Table 220 OPFOR SAM Battery (SA-13) Transitions from Occupy Firing Position (Hvy-1605)

Condition/Event	Hvy-1609 React To Ground Attack	Hvy-1607 Engage an Aerial Target	Hvy-1602 Take Actions on Incoming Indirect Fire
Receiving Air Fire		X	
Receiving Indirect Fire			X
Enemy Engaging	X		

Table 221 OPFOR SAM Battery (SA-13) Transitions from Engage Aerial Target (Hvy-1607)

Condition/Event	Hvy-1609 React To Ground Attack	Hvy-1602 Take Actions on Enemy Incoming Indirect Fire
Receiving Indirect Fire		X
Enemy Engaging	X	

Table 222 OPFOR Reconnaissance Patrol/Platoon Transitions from Conduct Tactical Road March (Hvy-1706)

Condition/Event	Hvy-0324 Fire Engagement	Hvy-0303 Take Air Defense Measures	Hvy-0302 Actions At An Obstacle
Receiving Air Fire		X	
Enemy Engaging	X		
Enemy < Plt	X		
Obstacle Detected			X

Table 223 OPFOR Reconnaissance Platoon/Patrol Transitions from Conduct Area Recon (Hvy-1712)

Condition/Event	H0303 Air Defense	H0324 Fire Engagement	H0325 Withdraw
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	Measures		
Receiving Ground Fire		X	X
Receiving Air Fire	X		
Enemy Assaults		X	X
Enemy <= Unit		X	
Enemy > Unit			X
Enemy >= Unit's Subordinate		X	
Enemy within Intermediate Range			X

Table 224 OPFOR Mine Warfare Platoon Transitions from Conduct Tactical Road March (Hvy-1802)

Condition/Event	H1804 Air Defense Action	H1803 Artillery Fire
Receiving Air Fire	X	
Receiving Indirect Fire		X

Table 225 OPFOR Mine Warfare Platoon Transitions from Lay A Mine Field (Hvy-1806)

Condition/Event	H1804 Air Defense Action	H1803 Artillery Fire
Receiving Air Fire	X	
Receiving Indirect Fire		X

Table 226 Automatic Grenade Launcher Platoon Transitions from Traveling (H1903)

Condition/Event	Hvy-0303 Take Air Defense Measures	Hvy-0329 Actions on Incoming Artillery Fire	Hvy-1906 Fire Engagements
Receiving Air Fire	X		
Receiving Indirect Fire		X	
Enemy Engaging			X
Enemy in Small Arms/Light MG Range			X

Table 227 OPFOR Grenade Launcher Platoon Transitions from Execute Fire Engagement (Hvy-1906)

Condition/Event	Hvy-0329 MRP Actions on Incoming Artillery	Hvy-0303 MRP Takes AD Measures
Receiving Air Fire		X
Receiving Indirect Fire	X	

Table 228 OPFOR Automatic Grenade Launcher Platoon Transitions from Occupy a Defensive Position (Hvy-1908)

Condition/Event	Hvy-1906 Execute a Fire Engagement	Hvy-0303 Take Air Defense Measures	Hvy-0329 Actions on Incoming Artillery Fire
Receiving Air Fire		X	

Receiving Indirect Fire			X
Enemy Assaults	X		
Night	X		

Table 229 OPFOR ATGM Platoon Transitions from Occupy a Defensive Position (Hvy-2003)

Condition/Event	Hvy-2001 Conduct a Defense	Hvy-2108 Take Air Defense Measures
Receiving Air Fire		X
Enemy Assaults	X	

Table 230 OPFOR ATGM Squad Transitions from Occupy a Defensive Position (Hvy-2101)

Condition/Event	Hvy-2102 Conduct a Defense	Hvy-2108 Take Air Defense Measures
Receiving Ground Fire	X	
Receiving Air Fire		X
Receiving Indirect Fire	X	
Antitank Threat	X	
Non-Antitank Threat	X	
Enemy <= Unit	X	
Enemy > Unit	X	
Enemy < Unit's Subordinate	X	
Enemy >= Unit's Subordinate	X	
Enemy within Close Range	X	
Enemy w/in Intermediate Range	X	
Enemy w/in Long Range	X	

Table 231 Technical (Construction) Platoon Transitions from Clear Route Of March (Hvy-2202)

Condition/Event	Hvy-1804 Take Air Defense Measures	Hvy-1803 Take Action on Incoming Artillery Fire
Receiving Air Fire	X	
Receiving Indirect Fire		X

Table 232 Technical (Construction) Platoon Transitions from Construct An Engineer Obstacle (Hvy-2206)

Condition/Event	Hvy-1804 Take Air Defense Measures	Hvy-1803 Take Action on Incoming Artillery Fire
Receiving Air Fire	X	

Receiving Indirect Fire		X
Table 233 Technical (Construction) Platoon Transitions from Clear A Natural Or Manmade Obstacle (Hvy-2207)		
Condition/Event	Hvy-1804 Take Air Defense Measures	Hvy-1803 Take Action on Incoming Artillery Fire
Receiving Air Fire	X	
Receiving Indirect Fire		X
Table 234 OPFOR Bridge Platoon Transitions from Conduct Tactical Road March (Hvy-2302)		
Condition/Event	Hvy-1804 Take Air Defense Measures	Hvy-1803 Take Action on Incoming Artillery Fire
Receiving Air Fire	X	
Receiving Indirect Fire		X
Table 235 OPFOR Bridge Platoon Transitions from Conduct Bridging Operations (Hvy-2306)		
Condition/Event	Hvy-1804 Take Air Defense Measures	Hvy-1803 Take Action on Incoming Artillery Fire
Receiving Air Fire	X	
Receiving Indirect Fire		X
Table 236 OPFOR Supply Platoon Transitions from Conduct Tactical Road March (Hvy-2402)		
Condition/Event	Hvy-2505 Actions on Incoming	
Receiving Indirect Fire	X	
Table 237 OPFOR Supply Platoon Transitions from Conduct Rearm Refuel Operations (Hvy-2405)		
Condition/Event	Hvy-2505 Action on Incoming	
Receiving Indirect Fire	X	
Table 238 OPFOR Maintenance Recovery Platoon Transitions from Conduct Tactical Road March (Hvy-2502)		
Condition/Event	Hvy-2505 Actions on Incoming	Hvy-0303 MRP Takes AD Measures
Receiving Air Fire		X
Receiving Indirect Fire	X	
Table 239 OPFOR Maintenance Recovery Platoon Transitions from Conduct Recovery Operations (Hvy-2506)		
Condition/Event	Hvy-2505 Actions on Incoming	Hvy-0303 MRP Takes AD Measures
Receiving Air Fire		X
Receiving Indirect Fire	X	

<i>Table 240 OPFOR Dismounted Infantry Transitions from Occupy a Defensive Position (Hvy-2908)</i>				
Condition/Event	Hvy-2906 Execute Fire Engagement	Hvy-2913 Take Actions on Artillery Fire	Hvy-2914 Air Defense Measures	Hvy-2909 Conduct a Defense
Receiving Ground Fire	X			
Receiving Air Fire			X	
Receiving Indirect Fire		X		
Enemy Assault				X

<i>Table 241 OPFOR DI Squad Transitions from Take Air Defense Measures (Hvy-2914)</i>		
Condition/Event	Hvy-2906 Fire Engagement	Hvy-2909 Conduct a Defense
Antitank Threat		X
Non-Antitank Threat	X	
Enemy <= Unit	X	
Enemy > Unit	X	X
Enemy within Close Range	X	
Enemy within Intermediate Range	X	

<i>Table 242 OPFOR Dismounted Infantry Transitions from Traveling (Hvy-2921)</i>		
Condition/Event	Hvy-2906 Execute Fire Engagement	Hvy-2914 Air Defense Measures
Receiving Ground Fire	X	
Receiving Air Fire		X

2. ORDER ELABORATION TABLES

<i>BLUFOR Order Elaboration Table</i>		
Order	Embedded Orders	Subordinate Orders
Tank Platoon Execute Vee Formation		
Tank Platoon Execute Column Formation		
Tank Platoon Execute Staggered Column Formation		
Tank Platoon Execute Wedge Formation		
Tank Platoon Execute Line Formation		
Tank Platoon Execute Herringbone Formation		
Tank Platoon Execute Action Front		
Tank Platoon Execute Action Right		
Tank Platoon Execute Action Left		
Tank Platoon Execute Action Rear		
Tank Platoon React to Indirect Fires		
Tank Platoon Execute Traveling	Tank Platoon Staggered Column, Tank Platoon Wedge, Tank Platoon Vee, Tank Platoon Line, Tank Platoon Column	
Tank Platoon Execute Bounding Overwatch		
Tank Platoon Perform AA Activities	Tank Platoon Column	
Tank Platoon Conduct Tactical Road March	Tank Platoon Herringbone	
Tank Platoon Execute Actions on Contact	Tank Platoon Execute Action Front, Tank Platoon Execute Action Rear, Tank Platoon Execute Action Left, Tank Platoon Execute Action Right	
Tank Platoon Occupy Platoon BP	Tank Plt Herringbone Formation Tank Plt Execute Platoon Defensive Mission	
Tank Platoon Consolidate and Reorganize		
Tank Platoon Perform Platform Fire and Movement		
Tank Platoon Assault Enemy	Tank Platoon Line Formation	

Position	Tank Platoon Consolidate and Reorganize	
Tank Platoon Execute Platoon Defensive Mission	Tank Platoon Consolidate and Reorganize	
Tank Platoon Displace to Subsequent BP	Tank Platoon Traveling Overwatch	
Tank Platoon Perform Resupply Operations	Tank Platoon Column Formation	
Tank Platoon Execute Contact Drill		
Tank Platoon Execute Traveling Overwatch		
Tank Platoon Take Active AD Measures while Moving		
Tank Platoon Take Active AD Measures while Stationary		
Tank Platoon Attack By Fire		
Tank Platoon Occupy Hasty BP		
Tank Platoon Perform Passage Of Lines	Tank Platoon Execute Column Formation Tank Platoon Execute Traveling	
Tank Platoon React to Dismounted Attack	Tank Platoon Displace to Subsequent BP Tank Platoon Consolidate and Reorganize	
Tank Platoon Take Action at Obstacle	Tank Platoon Execute Contact Drill Tank Platoon Execute Action Front Tank Platoon Execute Action Right Tank Platoon Execute Action Left Tank Platoon Execute Action Rear Tank Platoon Assault Enemy Position Tank Platoon Conduct Hasty Occupation Tank Platoon Perform Attack By Fire	
Mechanized Infantry Platoon Execute Column Formation		
Mechanized Infantry Platoon Execute Line Formation		
Mechanized Infantry Platoon Execute Wedge Formation		
Mechanized Infantry Platoon Execute Herringbone Formation		
Mechanized Infantry Platoon Execute Traveling	Mechanized Infantry Platoon Execute Column Formation Mechanized Infantry Platoon Execute Echelon Formation Mechanized Infantry Platoon	

	Execute Wedge Formation	
Mechanized Infantry Platoon Execute Traveling Overwatch		
Mechanized Infantry Platoon Execute Bounding Overwatch	Mechanized Infantry Platoon Mount Vehicle	
Mechanized Infantry Platoon Execute Action Left	Mechanized Infantry Platoon Execute Line Formation	
Mechanized Infantry Platoon Execute Action Right		
Mechanized Infantry Platoon React to Indirect Fire	Mechanized Infantry Platoon Mount Vehicle	
Mechanized Infantry Platoon React to Air Attack	Mechanized Infantry Platoon Execute Hasty Dismount Mechanized Infantry Platoon Mount Vehicle	
Mechanized Infantry Platoon Execute Hasty Dismount		
Mechanized Infantry Platoon Mount Vehicle		
Mechanized Infantry Platoon Occupy AA	Mechanized Infantry Platoon Execute Hasty Dismount	
Mechanized Infantry Platoon Conduct Tactical Road March	Mechanized Infantry Platoon Formation Orders Mechanized Infantry Platoon Hasty Dismount Mechanized Infantry Platoon Mount Vehicle	
Mechanized Infantry Platoon React to Direct Fire/ATGM	Mechanized Infantry Platoon Execute Hasty Dismount Mechanized Infantry Platoon Conduct Fire and Movement Mechanized Infantry Platoon Assault Mounted Mechanized Infantry Platoon Disengage Mounted Mechanized Infantry Platoon Disengage Dismounted	
Mechanized Infantry Platoon Support By Fire	Mechanized Infantry Platoon Mount Vehicle Mechanized Infantry Platoon Execute Hasty Dismount	
Mechanized Infantry Platoon Conduct Fire and Movement	Mechanized Infantry Platoon Execute Hasty Dismount Mechanized Infantry Platoon Consolidate and Reorganize	
Mechanized Infantry Platoon Breach Obstacle	Mechanized Infantry Platoon Execute Column Formation Mechanized Infantry Platoon Execute Line Formation Mechanized Infantry Platoon	

	Execute Wedge Formation Mechanized Infantry Platoon Execute Dismount Mechanized Infantry Platoon Establish Hasty BP	
Mechanized Infantry Platoon Assault Mounted	Mechanized Infantry Platoon Formation Orders Mechanized Infantry Platoon Hasty Dismount Mechanized Infantry Platoon Mount Vehicle	
Mechanized Infantry Platoon Consolidate and Reorganize	Mechanized Infantry Platoon Hasty Dismount	
Mechanized Infantry Platoon Establish Hasty BP		
Mechanized Infantry Platoon Defend BP		
Mechanized Infantry Platoon Disengage Mounted	Mechanized Infantry Platoon Mount Vehicle	
Mechanized Infantry Platoon Cross Defile	Mechanized Infantry Platoon Execute Hasty Dismount Mechanized Infantry Platoon Mount Vehicle	
Mechanized Infantry Platoon Clear Woodline	Mechanized Infantry Platoon Execute Hasty Dismount Mechanized Infantry Platoon Mount Vehicles	
Mechanized Infantry Platoon Emplace Hasty Minefield		
Mechanized Infantry Platoon Conduct Screen/Guard	Mechanized Infantry Platoon Execute Traveling	
Mechanized Infantry Platoon Move Dismounted		
Mechanized Infantry Platoon Cross Danger Area		
Mechanized Infantry Platoon React to Contact	Mechanized Infantry Platoon Support By Fire Mechanized Infantry Platoon Disengage Dismounted Mechanized Infantry Platoon Move Dismounted	
Mechanized Infantry Platoon Disengage Dismounted		
Mechanized Infantry Platoon Sustain		
Mechanized Infantry Platoon Move Dismounted		
Mechanized Infantry Platoon React to Contact Mounted	Mechanized Infantry Platoon Execute Hasty Dismount	

Mechanized Infantry Platoon Take Actions at Obstacle	Mechanized Infantry Platoon Establish Hasty BP Mechanized Infantry Platoon Execute Hasty Dismount	
Scout Platoon Perform Tactical Road March		
Scout Platoon Occupy AA		
Scout Platoon Perform Passage of Lines	Scout Platoon Perform Resupply Operations	
Scout Platoon React to Indirect Fire		
Scout Platoon Conduct Bounding Overwatch		
Scout Platoon Conduct Screen	Scout Platoon Conduct Bounding Overwatch	
Scout Platoon Execute Actions on Contact	Scout Platoon Conduct Screen	
Scout Platoon Conduct Screen	Scout Platoon Conduct bounding Overwatch	
Scout Platoon Perform Resupply Operations		
Scout Platoon Take AD Measures (Moving)		
Air Defense Artillery Platoon Stinger in March Column		
Air Defense Artillery Platoon Provide Stinger AD with TF	Air Defense Artillery Platoon Stinger in March Column	
Air Defense Artillery Platoon Occupy Team Firing Position		
Air Defense Artillery Platoon Travel To and Occupy NDP	Scout Platoon Perform Passage of Lines	
Battalion Task Force Occupy AA		Scout Platoon Occupy AA Company Team Occupy AA Air Defense Artillery Platoon Occupy Team Firing Position
Battalion Task Force Perform Tactical Road March		Scout Platoon Perform Tactical Road March Air Defense Artillery Platoon Stinger in March Column Company Team Perform Tactical Road March
Battalion Task Force Move Tactically		Company Team Perform Tactical Movement Company Team Change Formation
Battalion Task Force Breach Defended Obstacle		Tank Platoon Attack By Fire Mechanized Infantry Platoon Support By Fire Mechanized Infantry Platoon Execute Hasty Dismount

		Mechanized Infantry Platoon Conduct Fire and Movement Company Team Assault Enemy Position Tank Platoon Execute Traveling
Company Team Perform Tactical Movement		Tank Platoon Formation Orders Tank Platoon Bounding Overwatch Tank Platoon Traveling Overwatch Mech Inf Plt Formation Orders Mech Inf Plt Bounding Overwatch Mech Inf Plt Traveling Overwatch
Company Team Perform Tactical Road March		Tank Platoon Formation Orders Tank Platoon Tactical Road March Mech Inf Plt Formation Orders Mech Inf Plt Tactical Road March
Company Team Perform Actions on Contact	Company Team Assault Enemy Position Company Team Perform Tactical Movement Company Team Perform Attack Position Action	Tank Platoon Bounding Overwatch Tank Platoon Traveling Tank Platoon Formation Orders Mech Inf Plt Bounding Overwatch Mech Inf Plt Traveling Overwatch Mech Inf Plt Traveling Mech Inf Plt Support by Fire Mech Inf Plt Herringbone
Company Team Assault an Enemy Position	Company Team Perform Tactical Movement Company Team Change Formation	Tank Platoon Formation Orders Tank Platoon Traveling Tank Platoon Attack by Fire Mech Inf Plt Formation Orders Mech Inf Plt Traveling
Company Team Perform Attack Position Action	Company Team Conduct Tactical Road March Company Team Change Formation	Tank Platoon Formation Orders Tank Platoon Traveling Mech Inf Plt Formation Orders Mech Inf Plt Traveling Mech Inf Plt Traveling Overwatch Mech Inf Plt Hasty Dismount
Company Team Consolidate on the Objective		Tank Platoon Consolidate and Reorganize Mech Inf Plt Consolidate and Reorganize
Company Team Reorganize on the Objective		Tank Platoon Consolidate and Reorganize Mech Inf Plt Consolidate and Reorganize
Company Team Change Formation		Tank Platoon Formation Orders Mech Inf Plt Formation Orders
Company Team Occupy AA	Company Team Service Station Resupply	Tank Platoon Perform AA Activities Mechanized Infantry Platoon Occupy AA
Company Team Assault Position Activities	Company Team Change Formation	Mechanized Infantry Platoon Execute Hasty Dismount
Company Team Defend Against Air Attack		Tank Platoon Take AD Measures (Moving)

		Tank Platoon Take AD Measures (Stationary) Mechanized Infantry Platoon React to Air Attack Air Defense Artillery Platoon Stinger in March Column
Company Team Initiate Action Left		Tank Platoon Execute Action Left Mechanized Infantry Platoon Execute Action Left
Company Team Initiate Action Right		Tank Platoon10 Execute Action Right Mechanized Infantry Platoon10 Execute Action Right
Company Team React to Indirect Fire		Tank Platoon React to Indirect Fire Mechanized Infantry Platoon React to Indirect Fire
Company Team Defend	Company Team Occupy AA Company Team Consolidate on Objective	Mechanized Infantry Platoon Defend BP Tank Platoon Execute Plt Def Mission Tank Platoon React to Dismounted Attack
Company Team Breach an Obstacle		Mechanized Infantry Platoon Establish Hasty BP Mechanized Infantry Platoon Execute Traveling Tank Platoon Execute Traveling Tank Platoon Attack By Fire
Company Team Hasty River/Gap Crossing		Mechanized Infantry Platoon Execute Traveling Tank Platoon Execute Traveling Tank Platoon Occupy Hasty BP Mechanized Infantry Platoon Establish Hasty BP
Company Team React to Reinforced Obstacle	Company Team Initiate Action Left Company Team Initiate Action Right Company Team Breach An Obstacle	Tank Platoon Take Action at an Obstacle Mechanized Infantry Platoon Take Action at Obstacle
Company Team Service Station Resupply		Tank Platoon Perform Resupply Operations Mechanized Infantry Platoon Sustain
Armored Cavalry Troop Zone Recon		
Armored Cavalry Troop Perform Screen Operations	Armored Cavalry Troop Zone Recon	Tank Platoon Attack By Fire Mechanized Infantry Platoon Defend BP Mechanized Infantry Platoon Conduct Screen/Guard Ops
Armored Cavalry Troop Perform Actions on Contact	Armored Cavalry Troop Delay In Troop Sector	Scout Platoon Execute Actions on Contact Tank Platoon Assault Enemy Position

Armored Cavalry Troop Delay in Troop Sector	Armored Cavalry Troop Perform Screen Operations Armored Cavalry Troop Conduct Tactical Movement Armored Cavalry Troop Occupy an AA Armored Cavalry Troop Perform a Passage of Lines	Scout Platoon Conduct A Screen Tank Platoon Occupy Hasty BP Tank Platoon Occupy Platoon BP Tank Platoon Execute Platoon Defense Msn Tank Platoon Attack By Fire Tank Platoon Assault Enemy Position Tank Platoon Displace to Subsequent BP
Armored Cavalry Troop Conduct Tactical Movement	Armored Cavalry Troop Perform Actions on Contact	Tank Platoon Execute Traveling Overwatch Mechanized Infantry Platoon Establish Hasty BP Mechanized Infantry Platoon Execute Traveling Tank Platoon Execute Traveling Mechanized Infantry Platoon Execute Traveling Overwatch Tank Platoon Perform Attack By Fire Mechanized Infantry Platoon Support By Fire Mechanized Infantry Platoon Establish Hasty BP
Armored Cavalry Troop Occupy an AA		Tank Platoon Perform AA Activities Scout Platoon Occupy AA
Armored Cavalry Troop Perform Passage of Lines		Tank Platoon Perform Passage of Lines Scout Platoon Perform Passage of Lines
Armored Cavalry Troop Hasty Obstacle Breaching		Tank Platoon Occupy Hasty BP
Armored Cavalry Troop Take Active AD Measures		Tank Platoon Take Active AD Measures (M) Tank Platoon Take Active AD Measures (S) Mechanized Infantry Platoon React to Air Attack Air Defense Artillery Platoon Stinger in March Column
Armored Cavalry Troop Perform Resupply Operations		Tank Platoon Perform Resupply Mechanized Infantry Platoon52 Sustain
Air Cavalry Reconnaissance Troop Engage Targets		
Air Cavalry Reconnaissance Troop Conduct Area Recon	Air Cavalry Reconnaissance Troop Perform Actions On Contact	
Air Cavalry Reconnaissance Troop Perform Actions on Contact		
Attack Helicopter Company Engage		

Targets		
Attack Helicopter Company React to CM, Avn Units	Attack Helicopter Company Engage Targets	
Assault Helicopter Company Conduct Air Assault Opns		
Division Armored Cavalry Squadron Occupy a Squadron AA		Company Team Occupy Assembly Area Armored Cavalry Troop Occupy an AA
Division Armored Cavalry Squadron Conduct a Road March	Division Armored Cavalry Squadron Occupy a Squadron AA	Company Team Perform Tactical Road March Air Cavalry Reconnaissance Troop Conduct Area Reconnaissance Armored Cavalry Troop Conduct Tactical Movement
Division Armored Cavalry Squadron Delay	Division Armored Cavalry Squadron Conduct a Road March	Air Cavalry Reconnaissance Troop Conduct Area Reconnaissance Armored Cavalry Troop Delay in Troop Sector Company Team Assault Enemy Position Air Cavalry Reconnaissance Troop Engage Targets Attack Helicopter Company Engage Targets
Division Armored Cavalry Squadron Conduct Move to Contact	Battalion Task Force - Move Tactically	Company Team Consolidate on Objective Company Team Reorganize on Objective Air Cavalry Reconnaissance Troop Perform Actions On Contact Armored Cavalry Troop Perform Actions on Contact Armored Cavalry Troop Conduct Tactical Movement Armored Cavalry Troop Hasty Obstacle Breaching Company Team Assault Enemy Position Company Team Assault Position Activity Armored Cavalry Troop Perform Zone Recon Armored Cavalry Troop Perform Screen Operations Armored Cavalry Troop Delay in Troop Sector Company Team Perform Tactical Road March

<i>OPFOR Order Elaboration Table</i>		
Order	Embedded Orders	Subordinate Orders
Dismounted Infantry - Column Formation		
Dismounted Infantry - Line Formation		
Dismounted Infantry - Assault an Enemy Position	Dismounted Infantry - Line Formation Dismounted Infantry - Column Formation	
Dismounted Infantry - Take Actions at an Obstacle	Dismounted Infantry - Line Formation Dismounted Infantry - Occupy Defensive Position	
Dismounted Infantry - Execute Fire Engagement	Dismounted Infantry - Traveling Dismounted Infantry - Line Formation	
Dismounted Infantry - Occupy a Defensive Position		
Dismounted Infantry - Conduct a Defense		
Dismounted Infantry - Take Actions at Incoming Artillery		
Dismounted Infantry - Take Air Defensive Measures		
Dismounted Infantry - Traveling	Dismounted Infantry - Column Formation	
Motorized Rifle Platoon - Take Actions at an Obstacle	Motorized Rifle Platoon - Wedge Formation Motorized Rifle Platoon - Occupy Temporary Defensive Position Motorized Rifle Platoon - Dismount Motorized Rifle Platoon - Remount	Dismounted Infantry - Line Formation Dismounted Infantry - Occupy Defensive Position
Motorized Rifle Platoon - Take Air Defense Measures		
Motorized Rifle Platoon - Column Formation		
Motorized Rifle Platoon - Line Formation		
Motorized Rifle Platoon - Wedge Formation		
Motorized Rifle Platoon - Occupy an Assembly Area		
Motorized Rifle Platoon - Assault an Enemy Position		
Motorized Rifle Platoon - Conduct		

Fire Engagement		
Motorized Rifle Platoon - Occupy a Defensive Strongpoint		
Motorized Rifle Platoon - Occupy a Temporary Defensive Position		
Motorized Rifle Platoon - Conduct a Defense		
Motorized Rifle Platoon - Actions on Incoming Artillery Fire		
Motorized Rifle Platoon - Withdrawal/Disengagement		
Motorized Rifle Platoon - Dismount Infantry from Vehicles		
Motorized Rifle Platoon - Remount Infantry from Vehicles		
Motorized Rifle Platoon - Provide Security at the Halt	Motorized Rifle Platoon - Conduct Tactical Road March Motorized Rifle Platoon - Traveling Motorized Rifle Platoon - Dismount Motorized Rifle Platoon - Withdrawal Disengagement Motorized Rifle Platoon - Occupy Temporary Defensive Position	
Motorized Rifle Platoon - Traveling	Motorized Rifle Platoon - Column Formation Motorized Rifle Platoon - Line Formation Motorized Rifle Platoon - Wedge Formation	Motor Rifle Co - Formation Orders Tank Plt - Formation Orders Motor Rifle Co - Occupy a Defensive Position Tank Plt - Occupy a Defensive Position
Motorized Rifle Platoon - Take Evasive Actions		
Motorized Rifle Company - Column Formation		Motorized Rifle Platoon Column Formation Tank Platoon Column Formation
Motorized Rifle Company - Line Formation		Motorized Rifle Platoon Line Formation Tank Platoon Line Formation
Motorized Rifle Company - Wedge Formation		Motorized Rifle Platoon Wedge Formation Tank Platoon Wedge Formation
Motorized Rifle Company-Traveling	Motor Rifle Co-Occupy Temp Defensive Position	
Motorized Rifle Company-Assault an Enemy Position	Motor Rifle Co- Conduct Fire Engagement Motor Rifle Co -Occupy Temp Defensive Position Motor Rifle Co - Line Formation	Motor Rifle Plt - Occupy a Temp Defensive Position, Traveling, Fire Engagement, Assault Enemy Position, Take Actions at an Obstacle, Dismount Vehicles
Motorized Rifle Company-Occupy a Temporary Defensive		Motorized Rifle Plt - Occupy a Temp Defensive Position

Position		
Motorized Rifle Company - Withdrawal/Disengagement	Motor Rifle Co- Conduct Fire Engagement Motor Rifle Co - Occupy Temp Defensive Position Motor Rifle Co - Line Formation Motor Rifle Co- Conduct Tactical Road March	Tank Plt - Column Formation Tank Plt - Traveling Tank Plt - Fire Engagement Motor Rifle Plt -Column Formation Motor Rifle Plt- Fire Engagement Motor Rifle Plt- Traveling Motor Rifle Plt-Occupy Temp Def Position
Motorized Rifle Company- Attack From the March	Motor Rifle Co - Conduct Tactical Road March Motor Rifle Co - Assault Enemy Position Order Motor Rifle Co - Formation Orders Motor Rifle Co - Occupy Temp Def Position Motor Rifle Co - Traveling Motor Rifle Co - Take actions at an Obstacle Motor Rifle Co - Conduct Fire Engagement	Tank Plt - Column Formation Tank Plt - Traveling Tank Plt - Fire Engagement Motor Rifle Plt - Column Formation, Occupy Temp Def Position, Traveling, Fire Engagement, Assault Enemy Position, Take actions at an obstacle, Dismount Vehicles
Motorized Rifle Company- Conduct Fire Engagement		Motor Rifle Plt - Traveling Motor Rifle Plt - Fire Engagement Tank Plt - Traveling Tank Plt - Fire Engagement
Motorized Rifle Company- Tactical Road March	Motor Rifle Co - Occupy Temp Def Position Motor Rifle Co - Traveling Motor Rifle Co -Column Formation	Motor Rifle Plt - Occupy Temp Defensive Position Tank Plt - Occupy Temp Defensive Position
Motorized Rifle Company- Occupy Assembly Area	Motor Rifle Co- Column Formation	Motor Rifle Plt - Occupy an Assembly Area Tank Plt - Occupy an Assembly Area
Motorized Rifle Company- Actions on Incoming Artillery		Motor Rifle Plt - Take Actions on Incoming Fire
Motorized Rifle Company - Occupy a Defensive Strong Point		Motorized Rifle Platoon - Occupy a Defensive Strong Point
Motorized Rifle Company - Conduct a Defense		Motorized Rifle Platoon - Conduct a Defense
Motorized Rifle Company - Provide Movement Security	Motorized Rifle Company - Column Formation Motorized Rifle Company - Traveling	
Motorized Rifle Company - Conduct a Meeting Engagement		
Motorized Rifle Company - Conduct Combat in an Encirclement	Motorized Rifle Company - Occupy a Defensive Strong Point Motorized Rifle Company - Conduct a Defense Motorized Rifle Company - Assault an Enemy Position	Motorized Rifle Platoon - Assault an Enemy Position Dismounted Infantry - Assault an Enemy Position Motorized Rifle Platoon - Conduct a Defense

	Motorized Rifle Company - Occupy a Temporary Defensive Position	Motorized Rifle Platoon - Withdrawal Disengagement
Motorized Rifle Battalion - Column Formation		Motorized Rifle Company - Column Formation Recon Platoon - Column Formation Air Defense Platoon (SA-16) - Column Formation Antitank Guided Missile Platoon - Column Formation Automatic Grenade Launcher Platoon - Column Formation Supply Platoon - Column Formation Mine Warfare Platoon - Column Formation Bridge Platoon - Column Formation Technical (Construction) Platoon - Column Formation Air Defense Platoon (SA-16) - Column Formation Tank Company - Column Formation
Motorized Rifle Battalion - Traveling	Motorized Rifle Battalion - Column Formation Motorized Rifle Battalion - Occupy Temporary Defensive Position	Motorized Rifle Company - Column Formation Tank Company - Line Formation Motorized Rifle Company - Line Formation Motorized Rifle Company - Wedge Formation
Motorized Rifle Battalion - Occupy Assembly Area		Supply Platoon - Conduct Refuel - Rearm Operations Tank Company - Occupy a Temporary Defensive Position Motorized Rifle Company - Occupy Assembly Area
Motorized Rifle Battalion - Attack from the March	Motorized Rifle Battalion - Traveling Motorized Rifle Battalion - Column Formation Motorized Rifle Battalion - Line Formation	Motorized Rifle Company - Assault an Enemy Position Motorized Rifle Company - Occupy a Temporary Defensive Position
Motorized Rifle Battalion - Line Formation		Motorized Rifle Company - Line Formation Motorized Rifle Platoon - Line Formation Tank Platoon - Line Formation
Tank Platoon - Execute Wedge Formation		
Tank Platoon - Execute Column Formation		
Tank Platoon - Execute Line Formation		

Tank Platoon - Occupy an Assembly Area	Tank Platoon Traveling Tank Platoon Column	
Tank Platoon - Conduct Tactical Road March		
Tank Platoon - Take Actions at an Obstacle	Tank Platoon - Execute Wedge Formation Tank Platoon - Occupy a Temporary Defensive Position	
Tank Platoon Execute a Fire Engagement		
Tank Platoon - Occupy a Defensive Strong Point	Tank Platoon - Line Formation	Motorized Rifle Platoon - Dismount Dismounted Infantry - Occupy a Defensive Strong Point
Tank Platoon - Take Actions on Incoming Artillery		
Tank Platoon - Conduct a Defense		
Tank Platoon - Provide Force Security	Tank Platoon - Conduct Tactical Road March Tank Platoon - Occupy a Temporary Defensive Position Tank Platoon - Withdrawal Disengagement	
Tank Platoon - Assault an Enemy Position	Tank Platoon - Line Formation Tank Platoon - Column formation	
Tank Platoon - Air Defense Measures		
Tank Platoon - Occupy a Temporary Defensive Position		
Tank Platoon - Traveling	Tank Platoon - Column Formation Tank Platoon - Line Formation Tank Platoon - Wedge Formation	
Tank Platoon - Take Evasive Actions		
Tank Platoon - Withdrawal/ Disengagement	Tank Platoon - Occupy a Temporary Defensive Position Tank Platoon - Traveling	
Tank Company - Column Formation		Tank Platoon - Execute Column Formation Motorized Rifle Platoon - Execute Column Formation
Tank Company - Line Formation		Tank Platoon - Execute Column Formation Tank Platoon - Execute Line Formation Tank Platoon - Execute Wedge Formation Motorized Rifle Platoon - Execute Line Formation

Tank Company - Execute Wedge Formation		Tank Platoon - Execute Column Formation Tank Platoon - Execute Line Formation Tank Platoon - Execute Wedge Formation Motorized Rifle Platoon - Execute Line Formation
Tank Company - Traveling	Tank Company - Column Formation Tank Company - Line Formation Tank Company - Wedge Formation	
Tank Company - Assault an Enemy Position	Tank Company - Occupy Temporary Defensive Position Tank Company - Execute Line Formation Tank Company - Execute Wedge Formation Tank Company - Traveling	Motorized Rifle Platoon - Dismount Infantry Motorized Rifle Platoon - Assault an Enemy Position Motorized Rifle Platoon - Traveling Tank Platoon - Take Actions at Obstacle Tank Platoon - Execute Fire Engagement Tank Platoon - Assault an Enemy Position Tank Platoon - Occupy Temporary Defensive Position Tank Platoon - Traveling
Tank Company - Occupy a Defensive Strong Point		Tank Platoon Occupy a Defensive Strong Point Recon Platoon Recon From an Observation Post
Tank Company - Occupy a Temporary Defensive Position		Tank Platoon - Occupy a Temporary Defensive Position
Tank Company - Conduct a Defense		Tank Platoon - Conduct a Defense
Tank Company - Provide Movement Security	Tank Company - Column Formation Tank Company - Traveling	
Tank Company - Execute a Meeting Engagement		
Tank Company Withdrawal Disengagement	Tank Company - Column Formation Tank Company - Line Formation Tank Company - Traveling Tank Company - Occupy a Temporary Defensive Position	Tank Platoon - Traveling Tank Platoon - Wedge Formation Tank Platoon - Execute Fire Engagement Tank Platoon - Occupy a Temporary Defensive Position Tank Platoon - Column Formation
Tank Battalion - Column Formation		Tank Company - Execute Column Formation Mine Warfare Platoon - Execute Column Formation Technical (Construction) Platoon - Execute Column Formation

		Bridge Platoon - Execute Column Formation Motorized Rifle Company - Execute Column Formation Antitank Guided Missile Platoon - Execute Column Formation
Tank Battalion - Traveling	Tank Battalion - Occupy Temporary Defensive Position	Tank Company - Execute Column Formation Tank Company - Line Formation Tank Company - Wedge Formation
Tank Battalion - Occupy Assembly Area		Supply Platoon - Conduct Rearm-Refuel Operations Tank Company - Occupy a Temporary Defensive Position
Tank Battalion - Attack from the March	Tank Battalion - Traveling	Tank Company - Execute Column Formation Tank Company - Line Formation Tank Company - Wedge Formation Tank Platoon - Execute Column Formation Tank Platoon - Line Formation Tank Platoon - Wedge Formation Tank Company - Assault an Enemy Position Tank Company - Occupy a Temporary Defensive Position
ATGM Squad Occupy a Temporary Defensive Position		
ATGM Squad Conduct Defense		
ATGM Squad Take Air Defense Measures		
ATGM Squad - Take Actions on Incoming Artillery		
ATGM Platoon - Conduct a Defense		
ATGM Platoon - Occupy a Temporary Defensive Position		Motorized Rifle Platoon - Dismount Infantry
ATGM Platoon - Column Formation		
Mortar Battery - Column Formation		
Mortar Battery - Tactical Road March	Mortar Battery - Column Formation	
Mortar Battery - Take Air Defense Measures		
Mortar Battery - Occupy a Firing Position	Mortar Battery - Tactical Road March	

Mortar Battery - Conduct Unobserved Fire Mission		
Mortar Battery - Take Actions on Incoming Artillery Fire	Mortar Battery - Tactical Road March	
Self-Propelled Howitzer Battery - Column Formation		
Self-Propelled Howitzer Battery - Conduct Tactical Road March	Self-Propelled Howitzer Battery - Column Formation	
Self-Propelled Howitzer Battery - Take Actions on Incoming Artillery Fire	Self-Propelled Howitzer Battery - Tactical Road March	
Self-Propelled Howitzer Battery - Take Air Defense Measures		
Self-Propelled Howitzer Battery - Occupy Firing Position	Self-Propelled Howitzer Battery - Tactical Road March	
Self-Propelled Howitzer Battery - Conduct Unobserved Fire Mission		
Self-Propelled Howitzer Battery - Conduct Direct Fire Mission		
Self-Propelled Howitzer Battalion - Column Formation		Self-Propelled Howitzer Battery - Column Formation Air Defense Platoon (SA-16) - Column Formation
Self-Propelled Howitzer Battalion - Conduct Tactical Road March	Self-Propelled Howitzer Battalion - Column Formation	
Self-Propelled Howitzer Battalion - Deploy into Combat Formation	Self-Propelled Howitzer Battalion - Tactical Road March	Self-Propelled Howitzer Battery - Occupy Firing Position
Towed Howitzer Battery - Column Formation		
Towed Howitzer Battery - Conduct Tactical Road March	Towed Howitzer Battery - Column Formation	
Towed Howitzer Battery - Occupy Firing Position	Towed Howitzer Battery - Tactical Road March	
Towed Howitzer Battalion - Column Formation		Towed Howitzer Battery - Column Formation Air Defense Platoon (SA-16) - Column Formation
Towed Howitzer Battalion - Tactical Road March	Towed Howitzer Battalion - Column Formation	
Towed Howitzer Battalion - Deploy in Combat Formation	Towed Howitzer Battalion - Tactical Road March	Towed Howitzer Battery - Occupy Firing Position
Regimental Artillery GP Headquarters Plan Fire Support for Offensive Operations		
Air Defense Battery (SA-15) - Column Formation		

Air Defense Battery (SA-15) - Tactical Road March	Air Defense Battery (SA-15) - Column Formation	
Air Defense Battery (SA-15) - Occupy Air Defense Firing Position		
Air Defense Battery (SA-15) - Engage Aerial Target		
Antitank Gun Battery (Firing Platoon) - Column Formation		
Antitank Gun Battery (Firing Platoon) - Traveling	Antitank Gun Battery (Firing Platoon) - Column Formation	
Antitank Gun Battery (Firing Platoon) - Occupy a Defensive Position	Antitank Gun Battery (Firing Platoon) - Column Formation	
Antitank Gun Battery (Firing Platoon) - Conduct a Defense		
Air Defense Platoon (SA-16) - Column Formation		
Air Defense Platoon (SA-16) - Tactical Road March	Air Defense Platoon (SA-16) - Column Formation	
Air Defense Platoon (SA-16) - Occupy Air Defense Firing Position		
Air Defense Platoon (SA-16) - Engage Aerial Target		
Air Defense Battery (2S6) - Column Formation		
Air Defense Battery (2S6) - Tactical Road March	Air Defense Battery (2S6) - Column Formation	
Air Defense Battery (2S6) - Take Actions on Incoming Artillery Fire		
Air Defense Battery (2S6) - Occupy Air Defense Firing Position		
Air Defense Battery (2S6) - Engage Aerial Target		
Air Defense Battery (2S6) - Employ Target Acquisition Radar		
Air Defense Battery (2S6) - Provide Air Defense Coverage	Air Defense Battery (2S6) - Tactical Road March Air Defense Battery (2S6) - Employ Target Acquisition Radar Air Defense Battery (2S6) - Engage Aerial Target Air Defense Battery (2S6) - Occupy Air Defense Firing Position	
Air Defense Battery (SA-13) - Column Formation		
Air Defense Battery (SA-13) -	Air Defense Battery (SA-13) -	

Tactical Road March	Column Formation	
Air Defense Battery (SA-13) - Take Actions on Incoming Artillery Fire		
Air Defense Battery (SA-13) - Occupy Air Defense Firing Position		
Air Defense Battery (SA-13) - Engage Aerial Target		
Air Defense Battery (SA-13) - React to Enemy Ground Attack		
Recon Platoon - Column Formation		
Recon Platoon - Tactical Road March	Recon Platoon - Column Formation	
Recon Platoon - Conduct a Recon Patrol		
Mine Warfare Platoon - Column Formation		
Mine Warfare Platoon - Tactical Road March	Mine Warfare Platoon - Column Formation	
Mine Warfare Platoon - Take Actions On Incoming Artillery Fire		
Mine Warfare Platoon - Take Air Defense Measures		
Mine Warfare Platoon - Emplace a Minefield		
Automatic Grenade Launcher Platoon - Column Formation		
Automatic Grenade Launcher Platoon - Traveling	Automatic Grenade Launcher Platoon - Column Formation Automatic Grenade Launcher Platoon - Line Formation Automatic Grenade Launcher Platoon - Occupy a Defensive Position	
Automatic Grenade Launcher Platoon - Execute a Fire Engagement		
Automatic Grenade Launcher Platoon - Occupy a Defensive Position		
Technical (Construction) Platoon - Column Formation		
Technical (Construction) Platoon - Construct Engineer Obstacle		
Technical (Construction) Platoon - Clear Engineer Obstacle		
Technical (Construction) Platoon - Conduct Route Clearing Operation		

Bridge Platoon - Column Formation		
Bridge Platoon - Tactical Road March	Bridge Platoon - Column Formation	Maintenance/Recovery Platoon - Column formation
Bridge Platoon - Conduct Bridging Operations		
Supply Platoon - Column Formation		
Supply Platoon - Tactical Road March	Supply Platoon - Column Formation	
Supply Platoon - Conduct Rearm - Refuel Operations	Supply Platoon - Tactical Road March	
Maintenance/Recovery Platoon - Column Formation		
Maintenance/Recovery Platoon - Tactical Road March	Maintenance/Recovery Platoon - Column Formation	
Maintenance/Recovery Platoon - Conduct Recovery Operations		
Maintenance/Recovery Platoon - Actions On Incoming Artillery		
Attack Helicopter Flight - Conduct Attack on Ground Target		
Assault Helicopter Flight - Conduct Air Lift Operations		
Ground Attack Fixed Wing Aircraft Flight - Conduct Attack on Ground Target		

APPENDIX F – CIS TO TPSC

This appendix provides the status and utilization of the Combat Instruction Sets (CISs) used to develop the behaviors of the Computer Generated Forces (CGF) entities in CCTT. These CISs are categorized as follows:

fully automated (A) - behaviors are controlled by computer model

semi-automated (S) - behaviors can be constructed by SAF operator

incorporated (C) - behaviors in another CIS or implemented by software utility

deferred (D) - CIS not part of current CCTT baseline

Tables F-1 through F-12 list the tasks for the BLUFOR entities and identify the CISs that are in the current CCTT baseline. The CIS ID numbers are the identification of the corresponding natural language CIS. These tables also identify the ARTEP MTP task-performance measure and associated TPS Code. Note that there may be MTP tasks that are not documented in a CIS but can be conducted in CCTT. Only Table F-1 is listed here as a representative example.

Table F-1. BLUFOR Tank/Mech Inf Company Team (ARTEP 71-1-MTP)

CIS ID	Category	Description	Task ID	TPSC
B1101	A	Perform Tactical Movement	17-2-0301	3
B1102	A	Perform Tactical Road March	17-2-0302	3
B1104	A	Perform Actions on Contact	17-2-0304, TT-3, TT-6	2
B1105	A	Assault an Enemy position (Mounted)	17-2-0310	2
2B1106	A	Occupy Assembly Area	17-2-0325	1
B1108	A	Perform Attack Position Activities	17-2-0329	2
B1111	A	Consolidate on the Objective	17-2-0704	2
B1112	A	Reorganize on the Objective	17-2-0706	2
B1113	A	Execute Actions Upon Air Attack	TT-4	3
B1114	A	Change Formation	TT-1	3
B1116,1117	A	Initiate Action (Left and Right)	TT-2	2
B1119	A	React to Indirect Fires	TT-5	2
B1121	A	Defend	17-2-1021	2
B1124	A	Breach Obstacle	17-2-0501	2
B1129	A	Perform Hasty River/Gap Crossing	17-2-0332	3
B1144	A	Perform Service-Station Resupply	17-2-0703	3
B1145,1146	A	Execute Actions on Contact	TT-3	2
B1103	S	Perform Passage of Lines	17-2-0303	3
B1107	C	Perform Assault Position Activities	17-2-0328	2
B1109	D	Assault an Enemy Position (Dismounted)	17-2-0310	2
B1122	S	Perform an Attack by Fire	17-2-0311	4

CIS ID	Category	Description	Task ID	TPSC
B1123	S	Support by Fire	17-2-0306	4
B1126	S	Withdraw Not Under Enemy Pressure	17-2-0322	2
B1127	S	Perform Relief in place	17-2-0324	2
B1128	S	Assist Passage of Lines	17-2-0327	2
B1130	S	Delay	17-2-0321	3
B1131	D	Emplace an Obstacle	17-2-0502	3
B1132	C	React to a Reinforced Obstacle	TT-7	3
B1134	S	Perform Reconnaissance	17-2-0202	3
B1135	D	Occupy Objective Rally Point	17-2-0307	2
B1136	S	Linkup	17-2-0318	2
B1137	S	Perform Guard Operations	17-2-0330	2
B1138	S	Perform Screen Operations	17-2-0312	3
B1139	D	Perform Raid (Mounted and Dismounted)	17-2-0308	2
B1140	S	Perform Ambush	17-2-0309	2
B1141	S	Breakout From Encirclement	17-2-0319	3
B1142	S	Infiltrate/Exfiltrate	17-2-0320	2
B1143	D	Perform Tailgate Resupply	17-2-0702	3
B1147	S	Withdraw Under Enemy Pressure	17-2-0323	2
B1147	S	Employ Indirect Fire in Offense	17-2-0401 4	4
B1147	S	Employ Indirect Fire in Defense	17-2-0402 4	4
B1147	C	Use Passive Air Defense Measures	44-2-C001 2	2
B1147	S	Use Active Air Defense Measures	44-2-C002 2	2
B1147	S	Perform Logistical planning	17-2-0701 4	4
B1147	S	Maintain Operation Security	17-2-0201 1	1
B1147	S	Prepare For Combat	17-2-0101 2	2
B0002	A	Execute a Staggered Column formation	17-3-0204 3	3
B0003	A	Execute a Line Formation	17-3-0207 3	3
B0004	A	Execute a Wedge Formation	17-3-0205 3	3
B0006	A	Execute a Vee Formation	7-3-0206 3	3
B0008	A	Execute a Herringbone Formation	17-3-0202 2	2
B0009, 0010,0011, 0012	A	Action Drill - Left, Right, Front, Rear	Drill 2	3
B0013	A	React to Indirect Fires	Drill 5	2
B0014	A	Contact Drill	Drill 3	2
B0015	A	Execute Traveling	17-3-0209	3
B0016	A	Execute Bounding Overwatch	17-3-0211	3
B0017	A	Execute Traveling Overwatch	17-3-0210	3
B0018	A	Perform Assembly Area Activities	17-3-0200	1
B0019	A	Take Active AD Measures While Moving	44-3-C002	2

CIS ID	Category	Description	Task ID	TPSC
B0020	A	Take Active AD Measures While Stationary	44-3-C002	2
B0021	A	Conduct Tactical Road March	17-3-0212	3
B0022	A	Execute Actions on Contact	17-3-0221	4
B0024	A	Perform an Attack By Fire	17-3-0219	4
B0025	A	Conduct Hasty Occupation of Battle Position	17-3-0227	3
B0026	A	Occupy a Platoon Battle Position	17-3-0222	2
B0027	A	Perform a Passage of Lines	17-3-0215	2
B0029	A	Consolidation and Reorganization	12-3-C021	1
B0030	A	Perform Platoon Fire and Movement	17-3-0217	4
B0031	A	Assault an Enemy Position	17-3-0220	4
B0032	A	Execute a Platoon Defensive Mission	17-3-0225	3
B0036	A	Take Actions at an Obstacle	17-3-0401	4
B0041	A	Perform Resupply Operations	17-3-0601	3
B0001	C	Execute a Column Formation	17-3-0203	3
B0005	D	Execute Echelon Formation	17-3-0208	3
B0007	D	Execute a Coil Formation	17-3-0201	2
B0023	S	Perform Reconnaissance by Fire	17-3-0218	4
B0028	S	Assist a Passage of Lines	17-3-0214	1
B0033	C	React to Enemy Dismounted Attack	17-3-0224	3
B0035	S	Assist a Relief in Place	17-3-0226	3
B0037	D	Execute a Prepared Obstacle	17-3-0402	0
B0038	D	Construct a Hasty Obstacle	17-3-0403	1
B0039	D	Emplace a Hasty Protective Minefield	17-3-0404	0
B0040	S	Move in a Built-up Area	17-3-0213	4
B0042	D	Perform Maintenance Operations	17-3-0603	1
B0043	C	Establish an Observation Post	17-3-0302	0
B0044		Move Thru a Defile	17-3-2020	
B0045		Conduct Breach Force Operations	17-3-3070	
B0046		Conduct Assault Force Operations	17-3-3080	
B0047		Conduct Support Force Operations	17-3-3090	
B0047	C	Change of Formation Drill	Drill 1	3
B0047	C	Air Attack Drill	Drill 4	3
B0047	C	Take Passive AD Measures	44-3-C001	1
B0047	C	Employ Command & Control Measures	17-3-0105	4

CIS ID	Category	Description	Task ID	TPSC
B0047	C	Employ Camo & ECM Measures	17-3-0301	0
B0047	S	Perform Tactical Planning	17-3-0100	4

APPENDIX G – CCTT DIS ENUMERATIONS

EntityTypeValues

<i>DIS_Enumeration</i>	<i>DIS_Value</i>	<i>Description</i>
NOT_APPLICABLE	0.0.0.0.0.0.0	Not Applicable
WS_MCC	0.0.0.0.1.1.0	Master Control Console (MCC)
WS_TACP	0.0.0.0.1.10.0	Tactical Air Control Party (TACP)
WS_FSE	0.0.0.0.1.11.0	Fire Support Element (FSE)
WS_CTCP	0.0.0.0.1.12.0	Combat Trains Command Post (CTCP)
WS_UMCP	0.0.0.0.1.13.0	Unit Maintenance Collection Point (UMCP)
WS_SEM	0.0.0.0.1.14.0	Synthetic Environment Manager (SEM)
WS_SIMNET	0.0.0.0.1.15.0	SIMNET Protocol Translator
WS_MC	0.0.0.0.1.2.0	Maintenance Console (MC)
WS_AAR	0.0.0.0.1.3.0	After Action Review (AAR)
WS_SAF_BLUFOR_UCI	0.0.0.0.1.4.0	SAF BLUFOR User Console
WS_SAF_OPFOR_UCI	0.0.0.0.1.5.0	SAF OPFOR User Console
WS_SAF_CGF	0.0.0.0.1.6.0	SAF CGF Processor
WS_FDC	0.0.0.0.1.7.0	Fire Direction Center (FDC)
WS_CES	0.0.0.0.1.8.0	Combat Engineering Support (CES)
WS_FABTOC	0.0.0.0.1.9.0	Field Artillery Battalion TOC
MM_M1A1	0.0.0.0.2.1.0	M1A1 Manned Module
MM_M1A2	0.0.0.0.2.2.0	M1A2 Manned Module
MM_M2M3	0.0.0.0.2.3.0	M2M3 Manned Module
MM_M113A3	0.0.0.0.2.4.0	M113A3 Manned Module
MM_FISTV	0.0.0.0.2.5.0	FISTV Manned Module
MM_HMMWV	0.0.0.0.2.6.0	HMMWV Manned Module
MM_PL	0.0.0.0.2.7.0	DI Platoon Leader Manned Module
MM_SL	0.0.0.0.2.8.0	DI Squad Leader Manned Module
Mtu20_CHASSIS_WITHOUT_BRIDGE	1.1.222.0.1.28.0	M20 Chassis, No Bridge
Mtu20_BRIDGE	1.1.222.0.1.29.0	Mtu20 Bridge, AVLB Launched
MTU20	1.1.222.0.1.4.0	MTU-20 Armored Bridgelayar
CIS_TANK_1	1.1.222.1.0.0.1	CIS Tank, Spare 1

<i>DIS_Enumeration</i>	<i>DIS_Value</i>	<i>Description</i>
CIS_TANK_2	1.1.222.1.0.0.2	CIS Tank, Spare 2
CIS_TANK_3	1.1.222.1.0.0.3	CIS Tank, Spare 3
CIS_TANK_4	1.1.222.1.0.0.4	CIS Tank, Spare 4
CIS_TANK_5	1.1.222.1.0.0.5	CIS Tank, Spare 5
T80	1.1.222.1.1.1.0	T-80 Main Battle Tank (MBT)
T80_with_mine_plow_roller	1.1.222.1.1.1.1	T-80 Main Battle Tank (MBT) w/ Mine Plows/Rollers
T80UV	1.1.222.1.1.7.0	T-80UV Main Battle Tank (MBT)
T80UV_with_mine_plow_roller	1.1.222.1.1.7.1	T-80UV Main Battle Tank (MBT) w/ Mine Plows/Rollers
T72	1.1.222.1.2.1.0	T-72 Main Battle Tank (MBT)
T72_with_mine_plow_roller	1.1.222.1.2.1.1	T-72 Main Battle Tank (MBT) w/ Mine Plows/Rollers
T72BV	1.1.222.1.2.10.0	T-72BV Main Battle Tank (MBT)
T72BV_with_mine_plow_roller	1.1.222.1.2.10.1	T-72BV Main Battle Tank (MBT) w/ Mine Plows/Rollers
T64BV	1.1.222.1.3.4.0	T-64BV Main Battle Tank (MBT)
T64BV_with_mine_plow_roller	1.1.222.1.3.4.1	T-64BV Main Battle Tank (MBT) w/ Mine Plows/Rollers
T62	1.1.222.1.4.1.0	T-62 Main Battle Tank (MBT)
T62_with_mine_plow_roller	1.1.222.1.4.1.1	T-62 Main Battle Tank (MBT) w/ Mine Plows/Rollers
CIS_2S12	1.1.222.10.0.0.0	2S12 120-mm Mortar
CIS_Mortar_1	1.1.222.10.0.0.1	CIS Mortars, Spare 1
CIS_Mortar_2	1.1.222.10.0.0.2	CIS Mortars, Spare 2
CIS_Mortar_3	1.1.222.10.0.0.3	CIS Mortars, Spare 3
CIS_Mortar_4	1.1.222.10.0.0.4	CIS Mortars, Spare 4
CIS_Mortar_5	1.1.222.10.0.0.5	CIS Mortars, Spare 5
CIS_AFV_1	1.1.222.2.0.0.1	CIS Armored Fighting Vehicle, Spare 1
CIS_AFV_2	1.1.222.2.0.0.2	CIS Armored Fighting Vehicle, Spare 2
CIS_AFV_3	1.1.222.2.0.0.3	CIS Armored Fighting Vehicle, Spare 3
CIS_AFV_4	1.1.222.2.0.0.4	CIS Armored Fighting Vehicle, Spare 4
CIS_AFV_5	1.1.222.2.0.0.5	CIS Armored Fighting Vehicle, Spare 5
BMP1P	1.1.222.2.1.4.0	BMP-1P w/ AT-4 ATGW
BMP1KSHM	1.1.222.2.1.9.0	BMP-1KShM Unarmed Command
BTR80	1.1.222.2.13.1.0	BTR-80

<i>DIS_Enumeration</i>	<i>DIS_Value</i>	<i>Description</i>
BMP2	1.1.222.2.2.1.0	BMP-2
BMP3	1.1.222.2.3.0.0	BMP-3
BRDM2	1.1.222.2.4.0.0	BRDM-2 RECON, 14.5mm & 7.62 MG
BRDM2_AT5_ATGM	1.1.222.2.4.3.0	BRDM-2 w/ AT-5 ATGM
MTLB_1V12	1.1.222.2.7.1.0	MT-LB Tracked Vehicle, MT-LB 1V12
BTR60P	1.1.222.2.8.2.0	BTR-60, BTR-60P
KMT5M	1.1.222.3.0.0.0	KMT-5M Roller/Plow
CIS_auv_1	1.1.222.3.0.0.1	CIS Armored Utility Vehicle, Spare 1
CIS_auv_2	1.1.222.3.0.0.2	CIS Armored Utility Vehicle, Spare 2
CIS_auv_3	1.1.222.3.0.0.3	CIS Armored Utility Vehicle, Spare 3
CIS_auv_4	1.1.222.3.0.0.4	CIS Armored Utility Vehicle, Spare 4
CIS_auv_5	1.1.222.3.0.0.5	CIS Armored Utility Vehicle, Spare 5
BAT2	1.1.222.3.5.0.0	BAT-2 Combat Engineer Vehicle
BREM1	1.1.222.3.9.0.0	BREM-1 Recovery and Repair Vehicle
CIS_SPA_1	1.1.222.4.0.0.1	CIS Self-Propelled Artillery, Spare 1
CIS_SPA_2	1.1.222.4.0.0.2	CIS Self-Propelled Artillery, Spare 2
CIS_SPA_3	1.1.222.4.0.0.3	CIS Self-Propelled Artillery, Spare 3
CIS_SPA_4	1.1.222.4.0.0.4	CIS Self-Propelled Artillery, Spare 4
CIS_SPA_5	1.1.222.4.0.0.5	CIS Self-Propelled Artillery, Spare 5
SPA_2S3	1.1.222.4.1.0.0	M-1973 152-mm gun (2S3) (SO-152)
ZSU23_4	1.1.222.4.18.0.0	ZSU-23/4 Quad 23-mm AAA
SPA_2S1	1.1.222.4.2.0.0	M-1974 122-mm Howitzer (2S1) (SO-122)
SA13SAM	1.1.222.4.21.0.0	SA-13 SAM
SPA_2S6	1.1.222.4.22.0.0	2S6 Quad 30-mm/SA-19 AD System
SPA_2S19	1.1.222.4.26.0.0	152-mm 2S19 (aka MSTA-S)
SPA_2S23	1.1.222.4.28.0.0	120-mm Howitzer/mortar (2S23)
Zsu57	1.1.222.4.34.0.0	ZSU-57-2 twin 57-mm anti-aircraft gun system
SA15SAM	1.1.222.4.48.0.0	SA-15 SAM
SPA_2S31	1.1.222.4.52.0.0	BMP Chassis w/120-mm Combination Gun (2S31)
CIS_Tow_1	1.1.222.5.0.0.1	CIS Towed Artillery, Spare 1

<i>DIS_Enumeration</i>	<i>DIS_Value</i>	<i>Description</i>
CIS_Tow_2	1.1.222.5.0.0.2	CIS Towed Artillery, Spare 2
CIS_Tow_3	1.1.222.5.0.0.3	CIS Towed Artillery, Spare 3
CIS_Tow_4	1.1.222.5.0.0.4	CIS Towed Artillery, Spare 4
CIS_Tow_5	1.1.222.5.0.0.5	CIS Towed Artillery, Spare 5
D30	1.1.222.5.4.0.0	D-30 122-mm Gun Howitzer
MT12	1.1.222.5.7.0.0	T-12/MT-12 100-mm Antitank Gun
CIS_Swuv_1	1.1.222.6.0.0.1	CIS Small Wheeled Utility Vehicle, Spare 1
CIS_Swuv_2	1.1.222.6.0.0.2	CIS Small Wheeled Utility Vehicle, Spare 2
CIS_Swuv_3	1.1.222.6.0.0.3	CIS Small Wheeled Utility Vehicle, Spare 3
CIS_Swuv_4	1.1.222.6.0.0.4	CIS Small Wheeled Utility Vehicle, Spare 4
CIS_Swuv_5	1.1.222.6.0.0.5	CIS Small Wheeled Utility Vehicle, Spare 5
UAZ469B	1.1.222.6.2.0.0	UAZ-469B 4x4 600-kg Light Vehicle
CIS_Lwuv_1	1.1.222.7.0.0.1	CIS Large Wheeled Utility Vehicle, Spare 1
CIS_Lwuv_2	1.1.222.7.0.0.2	CIS Large Wheeled Utility Vehicle, Spare 2
CIS_Lwuv_3	1.1.222.7.0.0.3	CIS Large Wheeled Utility Vehicle, Spare 3
CIS_Lwuv_4	1.1.222.7.0.0.4	CIS Large Wheeled Utility Vehicle, Spare 4
CIS_Lwuv_5	1.1.222.7.0.0.5	CIS Large Wheeled Utility Vehicle, Spare 5
KRAZ255B	1.1.222.7.13.0.0	KRAZ-255B 6x6 7500-kg Truck (Generic)
KRAZ255B_FUEL	1.1.222.7.13.1.0	KRAZ-255B 6x6 7500-kg Truck, Fuel Service
GAZ66	1.1.222.7.8.0.0	GAZ-66 4x4 2000-kg Truck
CIS_Ltuv_1	1.1.222.9.0.0.1	CIS Large Tracked Utility Vehicles, Spare 1
CIS_Ltuv_2	1.1.222.9.0.0.2	CIS Large Tracked Utility Vehicles, Spare 2
CIS_Ltuv_3	1.1.222.9.0.0.3	CIS Large Tracked Utility Vehicles, Spare 3
CIS_Ltuv_4	1.1.222.9.0.0.4	CIS Large Tracked Utility Vehicles, Spare 4
CIS_Ltuv_5	1.1.222.9.0.0.5	CIS Large Tracked Utility Vehicles, Spare 5
GMZ_TML	1.1.222.9.20.0.0	GMZ Tracked Mine Layer
UK_TANK_1	1.1.224.1.0.0.1	UK Tank, Spare 1
UK_TANK_2	1.1.224.1.0.0.2	UK Tank, Spare 2
CHIEFTAIN	1.1.224.1.1.0.0	Chieftain MBT
CHALLENGER	1.1.224.1.2.0.0	Challenger MBT

<i>DIS_Enumeration</i>	<i>DIS_Value</i>	<i>Description</i>
UK_AFV_1	1.1.224.2.0.0.1	UK Armored Fighting Vehicle, Spare 1
UK_AFV_2	1.1.224.2.0.0.2	UK Armored Fighting Vehicle, Spare 2
WARRIOR	1.1.224.2.8.0.0	FV 510 Warrior
M60_BRIDGE	1.1.225.0.4.3.0	M60 Bridge, AVLB Launched
M60_CHASSIS_WITHOUT_BRIDGE	1.1.225.0.4.3.1	M60 Chassis, No Bridge
USA_TANK_1	1.1.225.1.0.0.1	USA Tank, Spare 1
USA_TANK_2	1.1.225.1.0.0.2	USA Tank, Spare 2
USA_TANK_3	1.1.225.1.0.0.3	USA Tank, Spare 3
USA_TANK_4	1.1.225.1.0.0.4	USA Tank, Spare 4
USA_TANK_5	1.1.225.1.0.0.5	USA Tank, Spare 5
M1_ABRAMS	1.1.225.1.1.1.0	M1 Abrams (105mm)
M1A1_ABRAMS	1.1.225.1.1.2.0	M1A1 Abrams
M1A2	1.1.225.1.1.3.0	M1A2
M1A1_MINE_ROLLERS	1.1.225.1.1.4.0	M1A1 Abrams w/ Mine Rollers
M1A1_MINE_PLOWS	1.1.225.1.1.5.0	M1A1 Abrams w/ Mine Plows
USA_AFV_1	1.1.225.2.0.0.1	USA Armored Fighting Vehicle, Spare 1
USA_AFV_2	1.1.225.2.0.0.2	USA Armored Fighting Vehicle, Spare 2
USA_AFV_3	1.1.225.2.0.0.3	USA Armored Fighting Vehicle, Spare 3
USA_AFV_4	1.1.225.2.0.0.4	USA Armored Fighting Vehicle, Spare 4
USA_AFV_5	1.1.225.2.0.0.5	USA Armored Fighting Vehicle, Spare 5
M2A2	1.1.225.2.1.1.0	M2A2 Bradley Infantry Fighting Vehicle (IFV)
M3A2	1.1.225.2.1.2.0	M3A2 Bradley Cavalry Fighting Vehicle (CFV)
M113A3	1.1.225.2.3.2.0	FMC M113 Armored Personnel Carrier (APC), M113A3
M93	1.1.225.2.30.0.0	M93 NBC Recon Vehicle
M981	1.1.225.2.8.0.0	M981 FIST-V
M1064	1.1.225.2.9.4.0	MM106 Mortar Carrier, M1064 120-mm
USA_auv_1	1.1.225.3.0.0.1	USA Armored Utility Vehicle, Spare 1
USA_auv_2	1.1.225.3.0.0.2	USA Armored Utility Vehicle, Spare 2
USA_auv_3	1.1.225.3.0.0.3	USA Armored Utility Vehicle, Spare 3
USA_auv_4	1.1.225.3.0.0.4	USA Armored Utility Vehicle, Spare 4

<i>DIS_Enumeration</i>	<i>DIS_Value</i>	<i>Description</i>
USA_auv_5	1.1.225.3.0.0.5	USA Armored Utility Vehicle, Spare 5
M88A2	1.1.225.3.1.2.0	M88 Medium Recovery Vehicle, M88A2
M577A2	1.1.225.3.11.0.0	M577/M577A1/M577A2 Command Post
M113	1.1.225.3.14.0.0	FMC (M113) APCAmbulance (Simnet Interop)
M60A1	1.1.225.3.4.2.0	M60A1 AVLB
M728	1.1.225.3.5.0.0	M728 Combat Engineer Vehicle (CEV)
M9	1.1.225.3.6.0.0	M9 Armored Combat Earthmover (ACE)
USA_SPA_1	1.1.225.4.0.0.1	USA Self-Propelled Artillery, Spare 1
USA_SPA_2	1.1.225.4.0.0.2	USA Self-Propelled Artillery, Spare 2
USA_SPA_3	1.1.225.4.0.0.3	USA Self-Propelled Artillery, Spare 3
USA_SPA_4	1.1.225.4.0.0.4	USA Self-Propelled Artillery, Spare 4
USA_SPA_5	1.1.225.4.0.0.5	USA Self-Propelled Artillery, Spare 5
M270	1.1.225.4.1.0.0	M270 Rapid Deployment Multiple Launch Rock_System (MLRS)
M109A5	1.1.225.4.3.6.0	MM109 155-mm SP Howitzer, M109A5
M109A6	1.1.225.4.3.7.0	MM109 155-mm SP Howitzer, M109A6
USA_Swuv_1	1.1.225.6.0.0.1	USA Small Wheeled Utility Vehicle, Spare 1
USA_Swuv_2	1.1.225.6.0.0.2	USA Small Wheeled Utility Vehicle, Spare 2
USA_Swuv_3	1.1.225.6.0.0.3	USA Small Wheeled Utility Vehicle, Spare 3
USA_Swuv_4	1.1.225.6.0.0.4	USA Small Wheeled Utility Vehicle, Spare 4
USA_Swuv_5	1.1.225.6.0.0.5	USA Small Wheeled Utility Vehicle, Spare 5
M998	1.1.225.6.1.1.0	LTV HMMWV, M998 Cargo/Troop Carrier w/o winch
M1044	1.1.225.6.1.10.0	HMMWV, M1044 Armament Carrier, Supplemental Armor, w/ winch
M966	1.1.225.6.1.3.0	LTV HMMWV, M966 TOW Missile Carrier, Basic Armor, w/o winch
M1025	1.1.225.6.1.7.0	LTV HMMWV, M1025 Armament Carrier, Basic Armor, w/o winch
M1043	1.1.225.6.1.9.0	HMMWV, M1043 Armament Carrier, Supplemental Armor, w/o winch
M58A3_with_rocket	1.1.225.6.4.1.0	M58/M59 Mine-clearing Charge (MICLIC) (Towed), M58A3
M58A3_without_rocket	1.1.225.6.4.1.1	M58/M59 (MICLIC), M58A3, without rocket
Teledyne_4X4	1.1.225.6.5.0.0	Teledyne 4x4 725-kg light forces vehicle

<i>DIS_Enumeration</i>	<i>DIS_Value</i>	<i>Description</i>
M151	1.1.225.6.7.0.0	M151 4x4 362-kg light vehicle and variants
USA_Lwuv_1	1.1.225.7.0.0.1	USA Large Wheeled Utility Vehicle, Spare 1
USA_Lwuv_2	1.1.225.7.0.0.2	USA Large Wheeled Utility Vehicle, Spare 2
USA_Lwuv_3	1.1.225.7.0.0.3	USA Large Wheeled Utility Vehicle, Spare 3
USA_Lwuv_4	1.1.225.7.0.0.4	USA Large Wheeled Utility Vehicle, Spare 4
USA_Lwuv_5	1.1.225.7.0.0.5	USA Large Wheeled Utility Vehicle, Spare 5
M35	1.1.225.7.1.0.0	M35/M44A2 6x6 2-1/2 Ton Cargo Truck series
M1078	1.1.225.7.12.1.0	M1078 Truck, Cargo; LMTV w/ Equipment
M1089_WINCH	1.1.225.7.12.17.0	M1089 Truck, Wrecker; MTV w/ Equipment, w/ Winch
M1091_WINCH	1.1.225.7.12.20.0	M1091 Truck, Tanker; MTV w/ Equipment, w/ Winch
M1083_VOLCANO	1.1.225.7.12.27.0	M1083 Truck, Cargo; MTV w/ Equipment; w/ Volcano
M1079	1.1.225.7.12.3.0	M1079 Truck, Van; LMTV w/ Equipment
M1083	1.1.225.7.12.8.0	M1083 Truck, Cargo; MTV w/ Equipment
M977	1.1.225.7.19.1.0	Oshkosh HEMTT M977 Cargo
M977_mine_rollers	1.1.225.7.19.1.1	Oshkosh HEMTT M977 Cargo w/ Mine Rollers
M977_mine_plows	1.1.225.7.19.1.2	Oshkosh HEMTT M977 Cargo w/ Mine Plows
M978	1.1.225.7.19.2.0	Oshkosh HEMTT M978 Fuel Servicing
M984E1	1.1.225.7.19.4.0	Oshkosh HEMTT M984A1 Wrecker
M985	1.1.225.7.19.5.0	Oshkosh HEMTT M985 Cargo
M985_mine_rollers	1.1.225.7.19.5.1	Oshkosh HEMTT M985 Cargo, w/ Mine Rollers
M985_mine_plows	1.1.225.7.19.5.2	Oshkosh HEMTT M985 Cargo, w/ Mine Plows
USA_Ltuv_1	1.1.225.9.0.0.1	USA Large Tracked Utility Vehicles, Spare 1
USA_Ltuv_2	1.1.225.9.0.0.2	USA Large Tracked Utility Vehicles, Spare 2
USA_Ltuv_3	1.1.225.9.0.0.3	USA Large Tracked Utility Vehicles, Spare 3
USA_Ltuv_4	1.1.225.9.0.0.4	USA Large Tracked Utility Vehicles, Spare 4
USA_Ltuv_5	1.1.225.9.0.0.5	USA Large Tracked Utility Vehicles, Spare 5
M992	1.1.225.9.2.0.0	M992 Field Artillery Ammunition Support Vehicle (FAASV)
FR_TANK_1	1.1.71.1.0.0.1	FRA Tank, Spare 1
FR_TANK_2	1.1.71.1.0.0.2	FRA Tank, Spare 2
AMX30	1.1.71.1.1.0.0	AMX-30

<i>DIS_Enumeration</i>	<i>DIS_Value</i>	<i>Description</i>
AMX40	1.1.71.1.3.0.0	AMX-40 MBT
FR_AFV_1	1.1.71.2.0.0.1	FRA Armored Fighting Vehicle, Spare 1
FR_AFV_2	1.1.71.2.0.0.2	FRA Armored Fighting Vehicle, Spare 2
AMX10RC	1.1.71.2.6.0.0	AMX-10RC Armored Car
AMX10	1.1.71.2.8.0.0	AMX-10 IFV
GER_TANK_1	1.1.78.1.0.0.1	GER Tank, Spare 1
GER_TANK_2	1.1.78.1.0.0.2	GER Tank, Spare 2
LEO1A4	1.1.78.1.1.4.0	Leopard 1 A5 MBT, A4
LEO2	1.1.78.1.2.0.0	Leopard 3 MBT
GER_AFV_1	1.1.78.2.0.0.1	GER Armored Fighting Vehicle, Spare 1
GER_AFV_2	1.1.78.2.0.0.2	GER Armored Fighting Vehicle, Spare 2
MARDER2	1.1.78.2.2.0.0	Marder 2
CIS_Attack_Strike_1	1.2.222.2.0.0.1	CIS Air Platform, Attack/Strike, Spare 1
CIS_Attack_Strike_2	1.2.222.2.0.0.2	CIS Air Platform, Attack/Strike, Spare 2
CIS_Attack_Strike_3	1.2.222.2.0.0.3	CIS Air Platform, Attack/Strike, Spare 3
CIS_Attack_Strike_4	1.2.222.2.0.0.4	CIS Air Platform, Attack/Strike, Spare 4
CIS_Attack_Strike_5	1.2.222.2.0.0.5	CIS Air Platform, Attack/Strike, Spare 5
MIG27	1.2.222.2.1.0.0	MiG-27- Flogger (Generic)
SU17	1.2.222.2.4.0.0	SU-17 Fitter (Generic)
SU24	1.2.222.2.7.0.0	SU-24 Fencer (Generic)
SU25	1.2.222.2.8.0.0	SU-25 Frogfoot (Generic)
CIS_Attack_Helicopter_1	1.2.222.20.0.0.1	CIS Air Platform, Attack Helicopter, Spare 1
CIS_Attack_Helicopter_2	1.2.222.20.0.0.2	CIS Air Platform, Attack Helicopter, Spare 2
CIS_Attack_Helicopter_3	1.2.222.20.0.0.3	CIS Air Platform, Attack Helicopter, Spare 3
CIS_Attack_Helicopter_4	1.2.222.20.0.0.4	CIS Air Platform, Attack Helicopter, Spare 4
CIS_Attack_Helicopter_5	1.2.222.20.0.0.5	CIS Air Platform, Attack Helicopter, Spare 5
MI28	1.2.222.20.1.1.0	Mi-28 Havoc, Mi-28
MI24P	1.2.222.20.2.6.0	Mi24/25/35 Hind, Mi-24P Hind F
KA50A	1.2.222.20.3.1.0	Ka-50 Hokum A Close Air Support
CIS_Utility_Helicopter_1	1.2.222.21.0.0.1	CIS Air Platform, Utility Helicopter, Spare 1

<i>DIS_Enumeration</i>	<i>DIS_Value</i>	<i>Description</i>
CIS_Utility_Helicopter_2	1.2.222.21.0.0.2	CIS Air Platform, Utility Helicopter, Spare 2
CIS_Utility_Helicopter_3	1.2.222.21.0.0.3	CIS Air Platform, Utility Helicopter, Spare 3
CIS_Utility_Helicopter_4	1.2.222.21.0.0.4	CIS Air Platform, Utility Helicopter, Spare 4
CIS_Utility_Helicopter_5	1.2.222.21.0.0.5	CIS Air Platform, Utility Helicopter, Spare 5
MI8TBK	1.2.222.21.1.4.0	Mi-8/9/17/171 Hip, Mi-8TBK (Mi-17) (
Hoplite	1.2.222.21.5.1.0	Mi-2 Hoplite, Mi-2 (only mfg in Poland)
USA_Fighter_1	1.2.225.1.0.0.1	USA Air Platform, Fighter/Air Defense, Spare 1
USA_Fighter_2	1.2.225.1.0.0.2	USA Air Platform, Fighter/Air Defense, Spare 2
USA_Fighter_3	1.2.225.1.0.0.3	USA Air Platform, Fighter/Air Defense, Spare 3
USA_Fighter_4	1.2.225.1.0.0.4	USA Air Platform, Fighter/Air Defense, Spare 4
USA_Fighter_5	1.2.225.1.0.0.5	USA Air Platform, Fighter/Air Defense, Spare 5
F16	1.2.225.1.3.0.0	General Dynamics F-16 Falcon, Generic
USA_Attack_Strike_1	1.2.225.2.0.0.1	USA Air Platform, Attack/Strike, Spare 1
USA_Attack_Strike_2	1.2.225.2.0.0.2	USA Air Platform, Attack/Strike, Spare 2
USA_Attack_Strike_3	1.2.225.2.0.0.3	USA Air Platform, Attack/Strike, Spare 3
USA_Attack_Strike_4	1.2.225.2.0.0.4	USA Air Platform, Attack/Strike, Spare 4
USA_Attack_Strike_5	1.2.225.2.0.0.5	USA Air Platform, Attack/Strike, Spare 5
A7	1.2.225.2.3.0.0	Vought A-7 Corsair II
A10A	1.2.225.2.4.1.0	Fairchild Republic A-10 Thunderbolt II, 1-10A
USA_Attack_Helicopter_1	1.2.225.20.0.0.1	USA Air Platform, Attack Helicopter, Spare 1
USA_Attack_Helicopter_2	1.2.225.20.0.0.2	USA Air Platform, Attack Helicopter, Spare 2
USA_Attack_Helicopter_3	1.2.225.20.0.0.3	USA Air Platform, Attack Helicopter, Spare 3
USA_Attack_Helicopter_4	1.2.225.20.0.0.4	USA Air Platform, Attack Helicopter, Spare 4
USA_Attack_Helicopter_5	1.2.225.20.0.0.5	USA Air Platform, Attack Helicopter, Spare 5
AH64	1.2.225.20.1.0.0	McDonnell-Douglas AH-64 Apache
AH1S	1.2.225.20.2.8.0	Bell Model 209 Hueycobra, Seacobra, Supercobra, AH-1S
USA_Utility_Helicopter_1	1.2.225.21.0.0.1	USA Air Platform, Utility Helicopter, Spare 1
USA_Utility_Helicopter_2	1.2.225.21.0.0.2	USA Air Platform, Utility Helicopter, Spare 2
USA_Utility_Helicopter_3	1.2.225.21.0.0.3	USA Air Platform, Utility Helicopter, Spare 3
USA_Utility_Helicopter_4	1.2.225.21.0.0.4	USA Air Platform, Utility Helicopter, Spare 4

<i>DIS_Enumeration</i>	<i>DIS_Value</i>	<i>Description</i>
USA_Utility_Helicopter_5	1.2.225.21.0.0.5	USA Air Platform, Utility Helicopter, Spare 5
UH60A	1.2.225.21.2.1.0	Sikorsky S-70A, UH-60A Blackhawk
USA_Cargo_Helicopter_1	1.2.225.23.0.0.1	USA Air Platform, Cargo Helicopter, Spare 1
USA_Cargo_Helicopter_2	1.2.225.23.0.0.2	USA Air Platform, Cargo Helicopter, Spare 2
USA_Cargo_Helicopter_3	1.2.225.23.0.0.3	USA Air Platform, Cargo Helicopter, Spare 3
USA_Cargo_Helicopter_4	1.2.225.23.0.0.4	USA Air Platform, Cargo Helicopter, Spare 4
USA_Cargo_Helicopter_5	1.2.225.23.0.0.5	USA Air Platform, Cargo Helicopter, Spare 5
Ch47D	1.2.225.23.1.3.0	Boeing Models 114/414, CH-47D
USA_Observation_Helicopter_1	1.2.225.24.0.0.1	USA Air Platform, Observation Helicopter, Spare 1
USA_Observation_Helicopter_2	1.2.225.24.0.0.2	USA Air Platform, Observation Helicopter, Spare 2
USA_Observation_Helicopter_3	1.2.225.24.0.0.3	USA Air Platform, Observation Helicopter, Spare 3
USA_Observation_Helicopter_4	1.2.225.24.0.0.4	USA Air Platform, Observation Helicopter, Spare 4
USA_Observation_Helicopter_5	1.2.225.24.0.0.5	USA Air Platform, Observation Helicopter, Spare 5
OH58D	1.2.225.24.2.1.0	Bell Model 406 AHIP, OH-58D Kiowa/Kiowa Warrior
Usa_Unmanned_Air_Vehicle	1.2.225.50.0.0.0	USA Air Platform, Unmanned Air Vehicle
CIS_Guided_Munition_1	2.0.222.1.0.0.1	CIS Guided Munition, Spare 1
CIS_Guided_Munition_10	2.0.222.1.0.0.10	CIS Guided Munition, Spare 10
CIS_Guided_Munition_2	2.0.222.1.0.0.2	CIS Guided Munition, Spare 2
CIS_Guided_Munition_3	2.0.222.1.0.0.3	CIS Guided Munition, Spare 3
CIS_Guided_Munition_4	2.0.222.1.0.0.4	CIS Guided Munition, Spare 4
CIS_Guided_Munition_5	2.0.222.1.0.0.5	CIS Guided Munition, Spare 5
CIS_Guided_Munition_6	2.0.222.1.0.0.6	CIS Guided Munition, Spare 6
CIS_Guided_Munition_7	2.0.222.1.0.0.7	CIS Guided Munition, Spare 7
CIS_Guided_Munition_8	2.0.222.1.0.0.8	CIS Guided Munition, Spare 8
CIS_Guided_Munition_9	2.0.222.1.0.0.9	CIS Guided Munition, Spare 9
CIS_Ballistic_Munition_1	2.0.222.2.0.0.1	CIS Ballistic Munition, Spare 1
CIS_Ballistic_Munition_10	2.0.222.2.0.0.10	CIS Ballistic Munition, Spare 10
CIS_Ballistic_Munition_11	2.0.222.2.0.0.11	CIS Ballistic Munition, Spare 11
CIS_Ballistic_Munition_12	2.0.222.2.0.0.12	CIS Ballistic Munition, Spare 12
CIS_Ballistic_Munition_13	2.0.222.2.0.0.13	CIS Ballistic Munition, Spare 13

<i>DIS_Enumeration</i>	<i>DIS_Value</i>	<i>Description</i>
CIS_Ballistic_Munition_14	2.0.222.2.0.0.14	CIS Ballistic Munition, Spare 14
CIS_Ballistic_Munition_15	2.0.222.2.0.0.15	CIS Ballistic Munition, Spare 15
CIS_Ballistic_Munition_16	2.0.222.2.0.0.16	CIS Ballistic Munition, Spare 16
CIS_Ballistic_Munition_17	2.0.222.2.0.0.17	CIS Ballistic Munition, Spare 17
CIS_Ballistic_Munition_18	2.0.222.2.0.0.18	CIS Ballistic Munition, Spare 18
CIS_Ballistic_Munition_19	2.0.222.2.0.0.19	CIS Ballistic Munition, Spare 19
CIS_Ballistic_Munition_2	2.0.222.2.0.0.2	CIS Ballistic Munition, Spare 2
CIS_Ballistic_Munition_20	2.0.222.2.0.0.20	CIS Ballistic Munition, Spare 20
CIS_Ballistic_Munition_3	2.0.222.2.0.0.3	CIS Ballistic Munition, Spare 3
CIS_Ballistic_Munition_4	2.0.222.2.0.0.4	CIS Ballistic Munition, Spare 4
CIS_Ballistic_Munition_5	2.0.222.2.0.0.5	CIS Ballistic Munition, Spare 5
CIS_Ballistic_Munition_6	2.0.222.2.0.0.6	CIS Ballistic Munition, Spare 6
CIS_Ballistic_Munition_7	2.0.222.2.0.0.7	CIS Ballistic Munition, Spare 7
CIS_Ballistic_Munition_8	2.0.222.2.0.0.8	CIS Ballistic Munition, Spare 8
CIS_Ballistic_Munition_9	2.0.222.2.0.0.9	CIS Ballistic Munition, Spare 9
CIS_Fixed_Munition_1	2.0.222.3.0.0.1	CIS Fixed Munition, Spare 1
CIS_Fixed_Munition_10	2.0.222.3.0.0.10	CIS Fixed Munition, Spare 10
CIS_Fixed_Munition_2	2.0.222.3.0.0.2	CIS Fixed Munition, Spare 2
CIS_Fixed_Munition_3	2.0.222.3.0.0.3	CIS Fixed Munition, Spare 3
CIS_Fixed_Munition_4	2.0.222.3.0.0.4	CIS Fixed Munition, Spare 4
CIS_Fixed_Munition_5	2.0.222.3.0.0.5	CIS Fixed Munition, Spare 5
CIS_Fixed_Munition_6	2.0.222.3.0.0.6	CIS Fixed Munition, Spare 6
CIS_Fixed_Munition_7	2.0.222.3.0.0.7	CIS Fixed Munition, Spare 7
CIS_Fixed_Munition_8	2.0.222.3.0.0.8	CIS Fixed Munition, Spare 8
CIS_Fixed_Munition_9	2.0.222.3.0.0.9	CIS Fixed Munition, Spare 9
Usa_Guided_Munition_1	2.0.225.1.0.0.1	USA Guided Munition, Spare 1
Usa_Guided_Munition_10	2.0.225.1.0.0.10	USA Guided Munition, Spare 10
Usa_Guided_Munition_2	2.0.225.1.0.0.2	USA Guided Munition, Spare 2
Usa_Guided_Munition_3	2.0.225.1.0.0.3	USA Guided Munition, Spare 3
Usa_Guided_Munition_4	2.0.225.1.0.0.4	USA Guided Munition, Spare 4

<i>DIS_Enumeration</i>	<i>DIS_Value</i>	<i>Description</i>
Usa_Guided_Munition_5	2.0.225.1.0.0.5	USA Guided Munition, Spare 5
Usa_Guided_Munition_6	2.0.225.1.0.0.6	USA Guided Munition, Spare 6
Usa_Guided_Munition_7	2.0.225.1.0.0.7	USA Guided Munition, Spare 7
Usa_Guided_Munition_8	2.0.225.1.0.0.8	USA Guided Munition, Spare 8
Usa_Guided_Munition_9	2.0.225.1.0.0.9	USA Guided Munition, Spare 9
Usa_Ballistic_Munition_1	2.0.225.2.0.0.1	USA Ballistic Munition, Spare 1
Usa_Ballistic_Munition_10	2.0.225.2.0.0.10	USA Ballistic Munition, Spare 10
Usa_Ballistic_Munition_11	2.0.225.2.0.0.11	USA Ballistic Munition, Spare 11
Usa_Ballistic_Munition_12	2.0.225.2.0.0.12	USA Ballistic Munition, Spare 12
Usa_Ballistic_Munition_13	2.0.225.2.0.0.13	USA Ballistic Munition, Spare 13
Usa_Ballistic_Munition_14	2.0.225.2.0.0.14	USA Ballistic Munition, Spare 14
Usa_Ballistic_Munition_15	2.0.225.2.0.0.15	USA Ballistic Munition, Spare 15
Usa_Ballistic_Munition_16	2.0.225.2.0.0.16	USA Ballistic Munition, Spare 16
Usa_Ballistic_Munition_17	2.0.225.2.0.0.17	USA Ballistic Munition, Spare 17
Usa_Ballistic_Munition_18	2.0.225.2.0.0.18	USA Ballistic Munition, Spare 18
Usa_Ballistic_Munition_19	2.0.225.2.0.0.19	USA Ballistic Munition, Spare 19
Usa_Ballistic_Munition_2	2.0.225.2.0.0.2	USA Ballistic Munition, Spare 2
Usa_Ballistic_Munition_20	2.0.225.2.0.0.20	USA Ballistic Munition, Spare 20
Usa_Ballistic_Munition_3	2.0.225.2.0.0.3	USA Ballistic Munition, Spare 3
Usa_Ballistic_Munition_4	2.0.225.2.0.0.4	USA Ballistic Munition, Spare 4
Usa_Ballistic_Munition_5	2.0.225.2.0.0.5	USA Ballistic Munition, Spare 5
Usa_Ballistic_Munition_6	2.0.225.2.0.0.6	USA Ballistic Munition, Spare 6
Usa_Ballistic_Munition_7	2.0.225.2.0.0.7	USA Ballistic Munition, Spare 7
Usa_Ballistic_Munition_8	2.0.225.2.0.0.8	USA Ballistic Munition, Spare 8
Usa_Ballistic_Munition_9	2.0.225.2.0.0.9	USA Ballistic Munition, Spare 9
Usa_Fixed_Munition_1	2.0.225.3.0.0.1	USA Fixed Munition, Spare 1
Usa_Fixed_Munition_10	2.0.225.3.0.0.10	USA Fixed Munition, Spare 10
Usa_Fixed_Munition_2	2.0.225.3.0.0.2	USA Fixed Munition, Spare 2
Usa_Fixed_Munition_3	2.0.225.3.0.0.3	USA Fixed Munition, Spare 3
Usa_Fixed_Munition_4	2.0.225.3.0.0.4	USA Fixed Munition, Spare 4

<i>DIS_Enumeration</i>	<i>DIS_Value</i>	<i>Description</i>
Usa_Fixed_Munition_5	2.0.225.3.0.0.5	USA Fixed Munition, Spare 5
Usa_Fixed_Munition_6	2.0.225.3.0.0.6	USA Fixed Munition, Spare 6
Usa_Fixed_Munition_7	2.0.225.3.0.0.7	USA Fixed Munition, Spare 7
Usa_Fixed_Munition_8	2.0.225.3.0.0.8	USA Fixed Munition, Spare 8
Usa_Fixed_Munition_9	2.0.225.3.0.0.9	USA Fixed Munition, Spare 9
SA13	2.1.222.1.25.0.0	SA-13 Gopher
SA15	2.1.222.1.27.0.0	SA-15
SA16	2.1.222.1.28.0.0	SA-16 Gimlet
SA18	2.1.222.1.30.0.0	SA-18
SA19	2.1.222.1.31.0.0	SA-19
CIS_23MM_HE	2.1.222.2.3.0.0	23mm Cannon HE
STINGER	2.1.225.1.15.0.0	ADM Stinger Missile
SONGSTER	2.2.222.1.10.0.0	AT-8 Songster
STABBER	2.2.222.1.12.0.0	AT-10 Stabber
SNIPER	2.2.222.1.13.0.0	AT-11 Sniper
SAGGER	2.2.222.1.5.0.0	AT-3 Sagger
SPIGOT	2.2.222.1.6.0.0	AT-4 Spigot
SPANDREL	2.2.222.1.7.0.0	AT-5 Spandrel
SPIRAL	2.2.222.1.8.0.0	AT-6 Spiral
SAXHORN	2.2.222.1.9.0.0	AT-7 Saxhorn
CIS_122MM_HEAT_FS	2.2.222.2.0.0.1	122mm HEAT-FS
CIS_23MM_HE_FRAG	2.2.222.2.1.0.0	23mm FRAG-HE
CIS_23MM_AP	2.2.222.2.1.0.1	23mm Cannon AP
CIS_115mm_heat_fs	2.2.222.2.10.0.1	115mm HEAT FS
CIS_115mm_he_frag	2.2.222.2.10.0.2	115mm HE FRAG
CIS_115mm_HVAPFSDS	2.2.222.2.10.0.3	115mm HVAPFSDS
CIS_125MM_HVAFSDS	2.2.222.2.11.1.0	125mm HVAFSDS
CIS_125MM_HEAT_FS	2.2.222.2.11.2.0	125mm HEAT-FS
CIS_30MM_AP	2.2.222.2.2.0.0	30mm AP-T HEI-T, 30mm Auto Cannon AP
CIS_73MM_FRAG_HE	2.2.222.2.4.0.1	73mm FRAG HE

<i>DIS_Enumeration</i>	<i>DIS_Value</i>	<i>Description</i>
CIS_73MM_HEAT_FS	2.2.222.2.4.0.2	73mm HEAT-FS
CIS_85MM_HEAT	2.2.222.2.8.0.1	85mm HEAT
CIS_MINE_AT	2.2.222.3.0.0.0	CIS Mine, Anti-Tank Mine
TOW2	2.2.225.1.1.3.0	BGM-71D TOW 2 Missile
DRAGON	2.2.225.1.2.0.0	Dragon ATGW
HELLFIRE	2.2.225.1.3.0.0	AGM-114 Hellfire
MAVERICK	2.2.225.1.4.0.0	AGM-65 Maverick
COPPERHEAD	2.2.225.1.5.0.0	M712 Copperhead Cannon Launched Guided Projectile
JAVELIN	2.2.225.1.8.0.0	Javelin Anti-Tank Missile
USA_12_7MM_A534	2.2.225.2.1.5.0	12.7mm A534 (4 Ball & 1 Tracer Mix)
USA_105MM_M833	2.2.225.2.10.10.0	105mm M833 APFSDS-T
USA_105MM_M900E1	2.2.225.2.10.11.0	105mm M900E1 APFSDS-T
USA_105MM_M456A2	2.2.225.2.10.5.0	105mm M456A2 HEAT-T
USA_105MM_M774	2.2.225.2.10.9.0	105mm M774 APFSDS-T
USA_120MM_M829A1	2.2.225.2.13.2.0	120mm M829A1 APFSDS-T
USA_120MM_M830	2.2.225.2.13.3.0	120mm M830 HEAT-MP-T
USA_120MM_M830E1	2.2.225.2.13.3.1	120mm M830E1 HEAT-MP-T
USA_155MM_M449	2.2.225.2.15.0.1	155mm Howitzer, M449 APCM
USA_20MM_AP	2.2.225.2.2.0.1	20mm AP
USA_20MM_HE	2.2.225.2.2.0.2	20mm HE
USA_25MM_M791	2.2.225.2.3.2.0	25mm M791 APDS-T
USA_25MM_M919	2.2.225.2.3.3.0	25mm M919 APFSDS-T
USA_30MM_AP	2.2.225.2.4.0.1	30mm AP (UK Warrior)
USA_30MM_AP_AUTO	2.2.225.2.4.0.2	30mm Auto Cannon AP
USA_30MM_GAU8A	2.2.225.2.4.2.0	30mm GAU-8/A
USA_84MM_M136	2.2.225.2.8.1.0	84mm M136 HEAT
USA_MINE_M21	2.2.225.3.0.0.0	M21 Heavy Antitank Mine
blu91	2.2.225.3.0.0.1	BLU-91 AT Mine
CIS_5_45MM	2.8.222.2.1.2.0	5.45mm Ball, Tracer
CIS_7_62MM	2.8.222.2.2.0.0	7.62mm Ball, API-T Machine Gun

<i>DIS_Enumeration</i>	<i>DIS_Value</i>	<i>Description</i>
CIS_12_7MM	2.8.222.2.4.0.0	12.7mm API, API-T Machine Gun
CIS_14_5MM	2.8.222.2.5.0.0	14.5mm (Generic)
CIS_MINE_AP	2.8.222.3.2.0.0	CIS Mine, Anti-Personnel
USA_5_56MM_M193TRACER	2.8.225.2.1.2.0	5.56mm, M193 Tracer
USA_7_62MM	2.8.225.2.2.0.0	7.62mm, API, API-T Machine Gun
USA_12_7MM	2.8.225.2.5.0.0	12.7mm (.50 Caliber Machine Gun, tracer)
blu92	2.8.225.3.0.0.1	BLU-92 AP Mine
USA_MINE_M16A1	2.8.225.3.1.3.0	Bounding Mines, M16A1
USA_MINE_CLAYMORE	2.8.225.3.2.0.0	Claymore Mine
CIS_81MM_RP	2.9.222.2.0.0.0	81mm RP-Type Smoke Grenade
CIS_FLARE	2.9.222.2.0.0.1	Flare, Illuminating
CIS_MCLC	2.9.222.2.0.0.2	Mine Clearing Line Charge
CIS_100MM_HEAT_FS	2.9.222.2.11.0.1	100mm HEAT-FS
CIS_100MM_FRAG_HE	2.9.222.2.11.0.2	100mm FRAG-HE
CIS_120MM_HEAT_FS	2.9.222.2.13.0.1	120mm GUN/MORTAR HEAT FS
Cis_120Mm_Gm_Wp	2.9.222.2.13.0.10	120mm Gm, White Phosphorous (Wp)
Cis_120Mm_Gm_heat_fs	2.9.222.2.13.0.11	120mm Gm, Heat Fs
Cis_120Mm_Mortar_Smoke	2.9.222.2.13.0.2	120mm Mortar, Smoke
Cis_120Mm_Mortar_He_Frag	2.9.222.2.13.0.3	120mm Mortar, He Frag
Cis_120Mm_Mortar_Illum	2.9.222.2.13.0.4	120mm Mortar, Illuminating
Cis_120Mm_Mortar_Incen	2.9.222.2.13.0.5	120mm Mortar, Incendiary
Cis_120Mm_Gm_Incen	2.9.222.2.13.0.6	120mm Gm, Incendiary
Cis_120Mm_Gm_He_Frag	2.9.222.2.13.0.7	120mm Gm, HE FRAG
Cis_120Mm_Gm_Illum	2.9.222.2.13.0.9	120mm Gm, Illuminating
CIS_122MM	2.9.222.2.14.0.0	122mm (Generic, Illum, FRAG HE, FLECHETTE)
Cis_122Mm_Rocket_Smoke	2.9.222.2.15.0.1	122mm Rocket, Smoke
Cis_122Mm_Rocket_He_Frag	2.9.222.2.15.0.2	122mm Rocket, HE FRAG
Cis_122Mm_Rocket_Icm	2.9.222.2.15.0.3	122mm Rocket, ICM
CIS_125MM_HE_FRAG	2.9.222.2.16.0.0	CIS 125mm HE FRAG
CIS_152MM	2.9.222.2.19.0.0	152mm Howitzer (Generic)

<i>DIS_Enumeration</i>	<i>DIS_Value</i>	<i>Description</i>
Cis_152Mm_He	2.9.222.2.19.0.1	152mm Howitzer, HE
Cis_152Mm_He_Vt	2.9.222.2.19.0.2	152mm Howitzer, HE (w/ VT Fuze)
CIS_30MM_HE_FRAG	2.9.222.2.5.0.0	30mm FRAG HE GRENADE
CIS_30MM_HE	2.9.222.2.5.0.1	30mm Auto Cannon HE
CIS_DEMOLITION	2.9.222.3.0.0.0	Explosive, Demolition
MK82LGU	2.9.225.1.14.0.0	Mk-82 (LGU), Laser Guided Bomb (GBU-12) w/impact fuze
MK82LGU_Dly_Tenth_Sec	2.9.225.1.14.0.1	Mk-82 (LGU), Laser Guided Bomb (GBU-12) w/.10 sec delay
MK82LGU_Dly_Quarter_Sec	2.9.225.1.14.0.2	Mk-82 (LGU), Laser Guided Bomb (GBU-12) w/.25 sec delay
MK84LGU	2.9.225.1.15.0.0	Mk-84 (LGU), Laser Guided Bomb (GBU-10) w/impact fuze
MK84LGU_Dly_Tenth_Sec	2.9.225.1.15.0.1	Mk-84 (LGU), Laser Guided Bomb (GBU-10) w/.10 sec delay
MK84LGU_Dly_Quarter_Sec	2.9.225.1.15.0.2	Mk-84 (LGU), Laser Guided Bomb (GBU-10) w/.25 sec delay
USA_165MM_HEP	2.9.225.2.0.0.0	165mm HEP
MCLC	2.9.225.2.0.0.1	Mine Clearing Line Charge (MCLIC)
USA_5INCH_ROCKET	2.9.225.2.0.0.2	5-inch Rockets
M87_MINE_CANISTER	2.9.225.2.0.0.3	M87 Mine Canister
USA_20MM_AUTO	2.9.225.2.1.0.0	20mm Auto Cannon
USA_120MM_M933	2.9.225.2.11.1.0	120mm Mortar, M933 HE
USA_120MM_M934	2.9.225.2.11.2.0	120mm Mortar, M934 HE (Impact Detonate)
USA_120MM_M934_PD	2.9.225.2.11.2.1	120mm Mortar, M934 HE (Point Detonate)
USA_120MM_M934_PROX	2.9.225.2.11.2.2	120mm Mortar, M934 HE (Proximity Detonate)
USA_120MM_M934_DLY	2.9.225.2.11.2.3	120mm Mortar, M934 HE (Delay Detonate)
USA_120MM_M57	2.9.225.2.11.3.0	120mm Mortar, M57 HE
USA_120MM_M68	2.9.225.2.11.4.0	120mm Mortar, M68 WP
USA_120MM_M929	2.9.225.2.11.5.0	120mm Mortar, M929 WP
USA_120MM_M91	2.9.225.2.11.6.0	120mm Mortar, M91 Illumination
USA_120MM_M930	2.9.225.2.11.7.0	120mm Mortar, M930 Illumination
USA_155MM_M116A1	2.9.225.2.14.0.3	155mm M116A1
USA_155MM_M731	2.9.225.2.14.0.4	155mm Howitzer M731 FASCAM ADAM

<i>DIS_Enumeration</i>	<i>DIS_Value</i>	<i>Description</i>
USA_155MM_M741	2.9.225.2.14.0.5	155mm Howitzer M741 FASCAM RAAMS
USA_155MM_M825WP	2.9.225.2.14.0.6	155mm Howitzer M825 WP (White Phosphorous)
USA_155MM_M107HE	2.9.225.2.14.2.0	155mm M107 HE
USA_155MM_M107HE_MT	2.9.225.2.14.2.1	155mm M107 HE, MT Fuze
USA_155MM_M107HE_VT	2.9.225.2.14.2.2	155mm M107 HE, VT Fuze
USA_155MM_M483A1	2.9.225.2.14.3.0	155mm M483A1 HE DP (ICM)
USA_155MM_M485A2	2.9.225.2.14.6.0	155MM, M485A2 Illumination
USA_227MM_SADARM	2.9.225.2.16.0.1	227mm Rocket (M26 w SADARM Warhead)
USA_227MM_AT2	2.9.225.2.16.0.2	227mm Rocket (M26 w/ AT2)
USA_227MM_M77	2.9.225.2.16.0.3	227mm Rocket (M26 w/ M77)
USA_227MM_TGW	2.9.225.2.16.0.4	227mm Rocket (M26 w/ TGW)
USA_7_62MM_A131	2.9.225.2.19.1.0	7.62mm A131 (4 Ball & 1 Tracer Mix)
USA_7_62MM_A141	2.9.225.2.19.3.0	7.62mm A141 (4 Ball & 1 Tracer Mix)
USA_25MM_M792	2.9.225.2.2.1.0	25mm M792 HE-I-T
USA_70MM	2.9.225.2.21.0.0	70mm (2.75 in) Rocket
USA_30MM_GPU5A	2.9.225.2.3.0.1	30mm GPU-5A Cannon
USA_30MM_HE	2.9.225.2.3.3.1	30mm HE (UK Warrior)
USA_30MM_HE_AUTO	2.9.225.2.3.3.2	30mm Auto Cannon HE
USA_40MM	2.9.225.2.4.1.0	40mm Grenade Cartridges
USA_40MM_M433	2.9.225.2.4.2.0	40mm M433 HEDP
M257RP	2.9.225.2.43.1.0	M257 L8A1/A3 Red Phosphorous Smoke Grenade
M257WP	2.9.225.2.43.2.0	M257 L8A1/A3 White Phosphorous Smoke Grenade
BLU109B	2.9.225.2.57.0.0	BLU-109/B Bomb w/impact fuze
BLU109B_Dly_Tenth_Sec	2.9.225.2.57.0.1	BLU-109/B Bomb w/.10 sec delay
BLU109B_Dly_Quarter_Sec	2.9.225.2.57.0.2	BLU-109/B Bomb w/.25 sec delay
CBU15	2.9.225.2.58.0.0	CBU 15
CBU52	2.9.225.2.59.0.0	CBU 52
CBU58	2.9.225.2.61.0.0	CBU 58
CBU71	2.9.225.2.62.0.0	CBU 71
CBU75	2.9.225.2.63.0.0	CBU 75

<i>DIS_Enumeration</i>	<i>DIS_Value</i>	<i>Description</i>
CBU87	2.9.225.2.64.0.0	CBU 87
CBU89	2.9.225.2.66.0.0	CBU 89
DURANDAL	2.9.225.2.69.0.0	Durandal
MK20	2.9.225.2.71.0.0	Mk-20
MK81	2.9.225.2.72.0.0	Mk-81
MK82	2.9.225.2.73.0.0	Mk-82 (Generic) w/ impact fuze
MK82_Dly_Tenth_Sec	2.9.225.2.73.0.1	Mk-82 w/.10 sec delay
MK82_Dly_Quarter_Sec	2.9.225.2.73.0.2	Mk-82 w/.25 sec delay
MK82AIR	2.9.225.2.73.0.3	Mk-82 w/ Air Inflatable Retarder w/impact fuze
MK82AIR_Prox	2.9.225.2.73.0.4	Mk-82 w/ Air Inflatable Retarder w/proximity fuze
MK82HD	2.9.225.2.73.0.5	Mk-82 w/ High-Drag Fins (SnakeEye)
MK82HD_Prox	2.9.225.2.73.0.6	Mk-82 w/ High-Drag Fins (SnakeEye) w/proximity fuze
MK83	2.9.225.2.74.0.0	Mk-83
MK84	2.9.225.2.75.0.1	Mk-84 (Generic) w/impact fuze
MK84_Dly_Tenth_Sec	2.9.225.2.75.0.2	Mk-84 (Generic) w/.10 sec delay
MK84_Dly_Quarter_Sec	2.9.225.2.75.0.3	Mk-84 (Generic) w/.25 sec delay
MK84AIR	2.9.225.2.75.0.4	Mk-84 w/ Air Inflatable Retarder
MK84AIR_Prox	2.9.225.2.75.0.5	Mk-84 w/ Air Inflatable Retarder w/proximity fuze
USA_5_56MM_M855	2.9.225.2.81.1.0	5.56mm, M855 Ball
USA_5_56MM_M856	2.9.225.2.81.2.0	5.56mm, M856 Tracer
USA_5_56MM_A064	2.9.225.2.81.3.0	5.56mm, A064 (4 ball & 1 Tracer mix)
USA_DEMOLITION	2.9.225.3.0.0.0	Explosive, Demolition
CIS_SOLDIER_SPARE_1	3.1.222.1.0.1.1	CIS DI Soldier w/ Spare 1
CIS_SOLDIER_SPARE_10	3.1.222.1.0.1.10	CIS DI Soldier w/ Spare 10
CIS_SOLDIER_SPARE_2	3.1.222.1.0.1.2	CIS DI Soldier w/ Spare 2
CIS_SOLDIER_SPARE_3	3.1.222.1.0.1.3	CIS DI Soldier w/ Spare 3
CIS_SOLDIER_SPARE_4	3.1.222.1.0.1.4	CIS DI Soldier w/ Spare 4
CIS_SOLDIER_SPARE_5	3.1.222.1.0.1.5	CIS DI Soldier w/ Spare 5
CIS_SOLDIER_SPARE_6	3.1.222.1.0.1.6	CIS DI Soldier w/ Spare 6
CIS_SOLDIER_SPARE_7	3.1.222.1.0.1.7	CIS DI Soldier w/ Spare 7

<i>DIS_Enumeration</i>	<i>DIS_Value</i>	<i>Description</i>
CIS_SOLDIER_SPARE_8	3.1.222.1.0.1.8	CIS DI Soldier w/ Spare 8
CIS_SOLDIER_SPARE_9	3.1.222.1.0.1.9	CIS DI Soldier w/ Spare 9
CIS_FIRE_TEAM	3.1.222.1.0.101.0	CIS DI Soldier w/ Fire Team
CIS_SQUAD	3.1.222.1.0.102.0	CIS DI Soldier w/ Squad
CIS_PLATOON	3.1.222.1.0.103.0	CIS DI Soldier w/ Platoon
CIS_SOLDIER	3.1.222.1.1.0.0	CIS DI Soldier
CIS_SOLDIER_AK74	3.1.222.1.206.1.0	CIS DI Soldier w/ Assault Rifle AK-74 and AKS-74, 5.45mm
CIS_SOLDIER_RPK74	3.1.222.1.217.1.0	CIS DI Soldier w/ Light RPK-74, 5.45-mm
CIS_SOLDIER_AGS17	3.1.222.1.227.1.0	CIS DI Soldier w/ Plamya Launcher, 30-mm AGS-17
CIS_SOLDIER_SA16	3.1.222.1.232.1.0	CIS DI Soldier w/ Gimlet SA-16 Missile
CIS_SOLDIER_AT7	3.1.222.1.236.1.0	CIS DI Soldier w/ Saxhorn AT-7 Missile
CIS_SOLDIER_AT4	3.1.222.1.237.1.0	CIS DI Soldier w/ Spigot A/B AT-14
CIS_SOLDIER_SA18	3.1.222.1.238.1.0	CIS DI Soldier w/ SA-18 Missile
CIS_SOLDIER_RPG7V	3.1.222.1.246.1.0	CIS DI Soldier w/ VAT Rocket Launcher RPG-7KS-74, 5.45mm
USA_SOLDIER	3.1.225.1.0.1.0	USA DI Soldier
USA_SOLDIER_SPARE_1	3.1.225.1.0.1.1	USA DI Soldier w/ Spare 1
USA_SOLDIER_SPARE_10	3.1.225.1.0.1.10	USA DI Soldier w/ Spare 10
USA_SOLDIER_SPARE_2	3.1.225.1.0.1.2	USA DI Soldier w/ Spare 2
USA_SOLDIER_SPARE_3	3.1.225.1.0.1.3	USA DI Soldier w/ Spare 3
USA_SOLDIER_SPARE_4	3.1.225.1.0.1.4	USA DI Soldier w/ Spare 4
USA_SOLDIER_SPARE_5	3.1.225.1.0.1.5	USA DI Soldier w/ Spare 5
USA_SOLDIER_SPARE_6	3.1.225.1.0.1.6	USA DI Soldier w/ Spare 6
USA_SOLDIER_SPARE_7	3.1.225.1.0.1.7	USA DI Soldier w/ Spare 7
USA_SOLDIER_SPARE_8	3.1.225.1.0.1.8	USA DI Soldier w/ Spare 8
USA_SOLDIER_SPARE_9	3.1.225.1.0.1.9	USA DI Soldier w/ Spare 9
USA_FIRE_TEAM	3.1.225.1.0.101.0	USA DI Soldier w/ Fire Team
USA_SQUAD	3.1.225.1.0.102.0	USA DI Soldier w/ Squad
USA_PLATOON	3.1.225.1.0.103.0	USA DI Soldier w/ Platoon
USA_SOLDIER_M249	3.1.225.1.116.1.0	USA DI Soldier w/ Squad Automatic Weapon (SAW) M249 5.56m

<i>DIS_Enumeration</i>	<i>DIS_Value</i>	<i>Description</i>
USA_SOLDIER_CLAYMORE	3.1.225.1.120.1.0	USA DI Soldier w/ Claymore Mine
USA_SOLDIER_M16A2	3.1.225.1.32.1.0	USA DI Soldier w/ M16A2 Assault Rifle
USA_SOLDIER_M60	3.1.225.1.52.1.0	USA DI Soldier w/ General Purpose M60 7.62mm
USA_SOLDIER_M203	3.1.225.1.73.1.0	USA DI Soldier w/ M203 40mm Grenade Launcher
USA_SOLDIER_DRAGON	3.1.225.1.80.1.0	USA DI Soldier w/ Dragon Medium Anti-Armor Missile
USA_SOLDIER_JAVELIN	3.1.225.1.81.1.0	USA DI Soldier w/ Javeline AAWS-M
USA_SOLDIER_STINGER	3.1.225.1.85.1.0	USA DI Soldier w/ Stinger Missile
USA_SOLDIER_AT4	3.1.225.1.97.1.0	USA DI Soldier w/ Light Anti-Armor Weapon M136 (AT4)
OBSERVATION_POST	3.1.225.2.0.0.0	USA DI Soldier (non-visible), Observation Post
Smoke	4.2.0.1.0.0.0	Smoke
Air_Burst_Tactical_Smoke	4.2.0.1.0.0.1	Smoke, Air Burst Tactical
Ground_Burst_Tactical_Smoke	4.2.0.1.0.0.2	Smoke, Ground Burst Tactical
FOG	4.2.0.2.0.0.0	Fog
CLOUD	4.2.0.3.0.0.0	Cloud
RAIN	4.2.0.4.0.0.0	Cloud with Rain Falling
SNOW	4.2.0.5.0.0.0	Cloud with Snow Falling
HAZE	4.2.0.6.0.0.0	Haze
GEMSS	5.1.0.0.0.0.0	GEMSS (Employed by UH60A)
Crater	5.1.0.15.0.0.0	Crater
Crater_Small	5.1.0.15.40.0.0	Crater, Small
Crater_Large	5.1.0.15.80.0.0	Crater, Large
BREACHED_MINEFIELD_LANE_MARKERS	5.1.0.18.0.0.0	Breached Lane Flags
MINEFIELD_MARKERS_OVAL	5.1.0.21.0.0.0	Minefield Markers, Oval
MINEFIELD_MARKERS_RECTANGULAR	5.1.0.21.0.0.1	Minefield Markers, Rectangular
ABATIS	5.1.0.21.0.2.0	Abatus, 8 tree
CONCERTINA_FENCE	5.1.0.21.0.6.0	Fence, Concertina, 3 roll
LOG_CRIB_RECTANGULAR	5.1.0.21.0.8.0	Log Crib, Rectangle
MINEFIELD_HASTY	5.1.0.21.10.0.0	Minefield, Hasty, 0-300 Meters
MINEFIELD_PREPARED	5.1.0.21.11.0.0	Minefield, Prepared, 0-500 Meters
MINEFIELD_SCATTERABLE	5.1.0.21.12.0.0	Minefield, Scatterable, Oval

<i>DIS_Enumeration</i>	<i>DIS_Value</i>	<i>Description</i>
PRESTOCK_AMMO	5.1.0.21.13.0.0	Prestock Entity (Ammo)
PRESTOCK_FUEL	5.1.0.21.14.0.0	Prestock Entity (Fuel)
TANK_DITCH	5.1.0.21.15.0.0	Tank_Ditch, 100-4 meters
BUILDING	5.1.0.22.1.1.0	Building, Indirect Fire Damage
BRIDGE_RIBBON	5.1.0.22.60.0.0	Bridge, Ribbon, 14 Sections
COVERED_MG_BUNKER	5.1.0.23.0.1.0	Covered Machine Gun Bunker
OVERHEAD_COVERED_POSITION	5.1.0.23.0.10.0	Overhead Covered Infantry Position
TURRET_HULL_ARMORED_VEHICLE_D EFILADE	5.1.0.23.0.3.0	Combined Turret/Hull Defilade Position, Armored Vehicle
TURRET_HULL_FIGHTING_VEHICLE_D EFILADE	5.1.0.23.0.5.0	Combined Turret/Hull Defilade Position, Fighting Vehicle
TURRET_HULL_MORTAR_CARRIER_DE FILADE	5.1.0.23.0.6.0	Combined Turret/Hull Defilade Position, Mortar Carrier
TURRET_HULL_TANK_DEFILADE	5.1.0.23.0.7.0	Combined Turret/Hull Defilade Position, Tank
INFANTRY_FIGHTING_POSITION	5.1.0.23.0.8.0	Infantry Fighting Position
MACHINE_GUN_POSITION	5.1.0.23.0.9.0	Machine Gun Prepared Position
FUEL	6.0.0.1.0.0.0	Fuel (Generic)
OILS	6.0.0.2.0.0.0	Oils
LUBRICANTS	6.0.0.3.0.0.0	Lubricants
FOOD	6.0.0.4.0.0.0	Food
SPARE_PARTS	6.0.0.5.0.0.0	Spare Parts
DI_PERSONNEL	6.0.0.6.1.0.0	Personnel, Dismounted Infantry
mine_plows	6.0.0.7.0.0.1	Mine Plows
mine_rollers	6.0.0.7.0.0.2	Mine Rollers
sincgars	7.1.225.1.1.1.0	SINGGARS Radio Model

GLOSSARY

2D	2 Dimensional
3D	3 Dimensional
AAR	After Action Review
ACK	ACKnowledge
AD	Air Defense
ADA	Air Defense Artillery
AMSAA	Army Materiel Systems Analysis Activity
AN/VVS	
AOI	Area of Interest
APC	Armored Personnel Carrier
APC	Armored Personnel Carrier
API	Application Program Interface
ARTEP	Army Training and Evaluation Program

ATGM	Anti-Tank Guided Missile
AVLB	Armored Vehicle Launching Bridge
AZ	Azimuth
BAT	Broadband Antenna Test
BFV	Bradley Fighting Vehicle
BIT	Built in Test
BLUFOR	Blue Forces (friendly)
BMP	Boyevaya Mashina Pekhoty Soviet combat vehicle
BN	Battalion
BOS	Battlefield Operating System
BRDM	Boyevaya Razvedyvatel'naya Dozornaya Mashina Russian combat reconnaissance patrol vehicle
BREM	
BTR	Bronetransporter Soviet APC
CAM	Computer Aided Manufacturing
CATT	Combined Arms Tactical Trainer
CCTT	Close Combat Tactical Trainer
CECOM	Communications Electronics COMmand
CES	Combat Engineering Support
CGF	Computer Generated Forces
CID	Commander's Integrated Display
CIGS	Computer Image Generation System
CIS	Combat Instruction Set
CITV	Commander's Independent Thermal Viewer
COMSEC	COMmunications SECurity
COTS	Commercial Off The Shelf
CPH	Commander's Popped Hatch
CPU	Central Processor Unit
CTCP	Combat Trains Command Post
CWS	Commander's Weapon System Sight
DAIS	Digital Audio Intercom System
DAR	Data Analysis and Reporting
DB	DataBase
dB	decibel
DI	Dismounted Infantry
DID	Driver's Integrated Display
DIS	Distributed Interactive Simulation
DMA	Defense Mapping Agency
DMD	Digital Messaging Device
DTED	Digital Terrain Elevation Data
EL	Elevation
EM	Environment Manager
ESIG	Evans & Sutherland Image Generator
FABTOC	Field Artillery Tactical Operations Center
FDC	Fire Direction Center
FDDI	Fiber Distributed Data Interface

FED	Forward Entry Device
FH	Frequency Hop
FIST-V	Fire Support Team Vehicle
FO	Forward Observer
FOV	Field Of View
FSCT	Fire Support Control Terminal
FSE	Fire Support Element
GAS	Gunner's Auxiliary Sight
GCDP	Gunner's Control Display Panel
GDF	General Database Format
GMZ	Gusenichnyy Mino-Zagraditel' Soviet armored track
GPS	Gunner's Primary Sight
GPSE	GPS Extension
HEAT	High Explosive Anti-Tank
HEMTT	Heavy Expanded Mobility Tactical Truck
HFOV	Horizontal Field Of View
HMMWV	High Mobility Multi-purpose Wheeled Vehicle
I/O	Input/Output
ID	IDentifier
IEEE	Institute of Electrical and Electronic Engineers
IG	Image Generator
Inf	Infantry
IP	Internet Protocol
IR	Infra-Red
IVC	Voice Instruction Channel
KE	Kinetic Energy
KHz	Kilo-Hertz
KIA	Killed In Action
KMT	
LAN	Local Area Network
LHN	Long Haul Network
LMTV	Light Medium Tactical Vehicle
LOD	Level Of Detail
LRF	Laser Range Finder
LSRI	Local Storage of Requested Information
MBC	Mortar Ballistic Computer
MC	Maintenance Console
MCC	Master Control Console
Mech	Mechanized
MHz	Mega-Hertz
MM	Manned Module
MPAT	Multi-Purpose Anti-Tank
MRSTDB	Multi-level Routing Support Terrain Database
MRTDB	Model Reference Terrain DataBase
MTP	Mission Training Plan
MRP	Motorized Rifle Platoon

MTU	Maximum Transmission Unit
N	North
NAK	Not AcKnowledge
NBC	Nuclear Biological Chemical
NE	NorthEast
NTC	National Training Center
NVG	Night Vision Goggle
OC	Operations Center
OLP	Optical Line Pair
OPFOR	Opposing Forces (enemy)
OTW	Out The Window
PDU	Protocol Data Unit
PIE	Process Interface Electronics
PL	Platoon Leader
PLT	PLaToon
PM	Program Management?
PO	Prepositioned Object
POST	Power On Self Test
POW	Prisoner of War
PVD	Planned View Display
RCU	Remote Control Unit
RTS	Run Time Software
SA	Surface to Air
SAF	Semi-Automated Forces
SED-SSO	Software Engineering Directorate-STRICOM Support Office
SEDRIS	Synthetic Environment Data Representation and Interchange Specification
SEM	Synthetic Environment Manager
SEP	System Enhancement Package
SIF	Standard Interchange Format
SIMNET	SIMulation NETwork
SINCGARS	Single-Channel Ground-to-Air Radio System
SME	Subject Matter Expert
SRM	SINCGARS Radio Model
STRICOM	Army Simulation, Training and Instrumentation Command
SW	SouthWest
TACFIRE	TACTical FIRE direction system
TACP	Tactical Air Control Party
TCP/IP	Transmission Control Protocol/Internet Protocol
TECOM	Army Test and Evaluation Command
TOC	Tactical Operations Center
TOW	Tube-launched, Optically-tracked, Wire command link guided missile
TPSC	Task Performance Support Codes
TRAC-WSMR	Army Training and Doctrine Command Analysis Center-White Sands
TRADOC	U.S. Army Training and Doctrine Command
TRU	Thermal Receiving Unit
TSD	Army Threat Support Directorate

TSM	Training Systems Manager
UCI	User Computer Interface
UDP	User Datagram Protocol
UMCP	Unit Maintenance Collection Point
UTC	Universal Coordinated Time
VV&A	Verification, Validation and Accreditation
W	West
WS	Workstation
ZSU	Soviet anti-aircraft vehicle